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The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[OFFICIAL NOTICE.]

February Meeting, Society of Gas Lighting.

OFFICE OF THE SECRETARY, January 25, 1894.

The February meeting of the Society will be held at Hotel Washington, Jersey City, N. J., on Thursday, February 8, at 3 o'clock, P.M.

F. S. BENSON, Secretary.

[OFFICIAL NOTICE.]

Twenty-Fourth Annual Meeting, New England Association of Gas Engineers.

NEW ENGLAND ASSOCIATION OF GAS ENGINEERS, OFFICE OF THE SECRETARY, LYNN, MASS., Jan. 18, 1894.

The twenty-fourth annual meeting of the New England Association of Gas Engineers will be held at Young's Hotel, Boston, on Wednesday and Thursday, February 21st and 22d. The meeting will be called to order at 10 o'clock, Wednesday morning.

A general invitation is extended to members to contribute to the interest of the meeting by papers or questions for the Question Box.

A list of the papers and questions to be considered will be published later.

C. F. PRICHARD, Secretary.

BRIEFLY TOLD.

THE ANNUAL MEETING OF THE CONSOLIDATED GAS COMPANY.—The annual meeting of the Consolidated Gas Company, of New York, was brought off on the 22d of January, under circumstances which occasioned more than ordinary interest, for it had been reported that some important changes were likely to occur in the executive management of the Company. Naturally this belief was the magnet which brought out a large vote and the attendance of individual shareholders was also on the large scale. In the ballot for Trustees there was no contest, the successful ballot bearing the following names: Thomas K. Lees, Oscar Zollikoffer, Thomas Rutter, Harrison E. Gawtry, Percy R. Pyne, Samuel Sloane, James W. Smith, John P. Huggins, William Rockefeller, Rosewell G. Rolston, M. Taylor Pyne, George F. Baker and James Stillman. The changes from last year's Trustees are in the substitution of the names of Messrs. M. Taylor Pyne, George F. Baker and James Stillman for those of H. Clausen, Jr. (deceased), Welcome S. Jarvis and Eugene Higgins, and have no special significance. The new members of the Board are widely and favorably known in the financial life of New York, and bring to the counsels of the Company the value of years of experience gained by close contact with the very best practice of business in this city. The reports submitted were pleasing evidences of the Company's growth and solidity. On January 28th the Trustees met for organization, and it was here that the rumors of an important change were sustained. Mr. James W. Smith refused to accept a re-election to the Presidency, whereupon the Board elected Mr. Harrison E. Gawtry to the first place. The other executives chosen were: First Vice President, Thomas K. Lees; Second Vice-President, Oscar Zollikoffer; Secretary, Oscar F. Zollikoffer; Treasurer, George W. Doane. Mr. Smith, however, consented to act as Chairman of the Executive Committee, and besides will act on the Finance and other Committees. We can and do, with the utmost positiveness, assert that the only cause for Mr. Smith's retirement was his desire to be relieved from the strain of leadership, which he has maintained with such dignity and advantage to the Company since his accession thereto on the death of General Roome. A man of rare business talents, backed by unbounded courage and the faculty of a diplomat, he has served the Company faithfully and well. His successor, Mr. Gawtry, is well qualified to take up the burden of official responsibility at the point where his predecessor put it from him, and the shareholders in this huge undertaking have the satisfaction of knowing that their interests are sure to be guarded by Mr. Gawtry with zeal and success.

MAJOR BYRNE AND HIS GAS COMPANIES.—Philadelphia having taken the bull by the horns, in putting the gas rate down to $1 per 1,000 cubic feet from $1.50, seems now to be somewhat in doubt over the wisdom of that heroic action; and many other disinterested observers share with the Quaker City her fears as to whether the dose was rather more than she can safely assimilate. However, the Select Councils have appointed a special committee charged with the task of inquiring into the most likely plan whereby the Philadelphia gas plants could be best fitted for producing gas in the most economical manner, and so on. Of course, no one supposes that the Committee—that is, no one outside of its own membership—will accomplish much in the direction proposed; still, having been appointed, meetings had to be held and visits of inspection made, just to show the people that the Committee "were alive to their whole duty." Late last month (to be precise, the date was January 29th), the Committee met in the office of Mayor Stuart and there and then proceeded to get at the bottom facts. About the first gentleman to unbosom himself was "Major Byrne, of New York," who modestly admitted, by way of introduction and recommendation, that "in connection with other gentlemen, he had large investments in different gas plants throughout the country; these investments amounting in two instances to complete control of the works." We suppose that the Major's "two companies" are the Citizens Company, of Brooklyn, N. Y., and the Company at Detroit, Michigan, in both of which the Major and other gentlemen of his acquaintance are or have been controlling factors. Well, the Major went on to say that he thought his friends would like to purchase the Philadelphia gas works at anything like a fair price, as he fully believed that the works, if properly equipped and managed, could be made to yield a good profit, on a fair purchase price, on a gas sales' rate of $1 per 1,000. The Major had much to say in commendation of water gas, as against "the old-fashioned coal gas," furnished quite a flood of information anent the "heat units" contained in water gas and coal gas, discoursed very knowingly over the item of "leakage," which he thought would be about normal at 4 per cent., and had much else to say about the gas situation in general. Indeed, the Major was a most entertaining testifier, even if his statements were a trifle more ornate than serviceable; but what we wish to single out for exhibition is the present standing of the two Companies that are confessedly controlled by his friends and himself. Prior to their advent in dominating the Citizens Company, of Brooklyn, the stock of that concern was worth par; to-day one could buy all that he wanted of it for 60—it is true, the Company's obligations in the bonded line are very much larger than they were. So much for the Brooklyn example. Now, as to the Detroit type. Prior to the advent of Major Byrne and his friends to control in the Detroit Company, its shares were of the most desirable investments in the West; to-day the bonds which have been placed upon the Company are dull and listless, at 60 or thereabouts. As for the stock, it is best not to attempt to name a figure representing its "value." The moral of this is all quite plain, and to write it out would read about like the following: If the Major and his friends secured control of the Philadelphia plant the "heat units" in the gas they manufactured would be equalled by the weight of water that went into the stocks and bonds that were floated.

ANOTHER EFFECT OF THE PHILADELPHIA REDUCTION.—A portion of the city of Philadelphia is supplied with gas by a private corporation (the Northern Liberties Gas Company), which has the exclusive right to the territory in which it operates, and which comprises all of the 11th and 12th wards, and a portion of the 16th and 17th wards. After much deliberation on the part of the Trustees of the Company, it was determined to reduce the selling rate to $1.25 per 1,000 cubic feet, a careful examination of the Company's business and prospects showing that it would be impossible to earn a fair return on the capital invested at any lower rate. The annual output of the Company does not exceed 95,000,000 cubic feet, and the district which it supplies has to all intents and purposes gained its maximum growth. That is, it is built up, with very small probability that any rebuilding will tend to increase its value as a field for gas consumption. Another hardship which the Company has to face is a provision in its charter obliging it to furnish gas to the public lamps and public buildings at a rate 50 per cent. less than the rate which it charges ordinary consumers. So under the new schedule the Company can exact but 62½ cents per 1,000 from the city. It is true the number of public lamps which it supplies is less than 300—about 280—and that the quantity of gas supplied to the city under other heads is small, which, however, is largely a matter of fortuitous circumstance; and, in any event, it is all too heavy to be welcomed. Considering this, and the further fact that the Company's taxes, on each and all accounts, probably amount to no less than 12 cents per 1,000 cubic feet, the $1.25 rate in the Northern Liberties district is not far from equal to the $1 rate over Philadelphia at large—this opinion, of course, to be formed in connection with the greater cost per 1,000 of manufacturing and distributing 95,000,000 cubic feet per annum as against 3,750,000,000 cubic feet per annum.

NOTES.—Assemblyman Burtis has introduced a bill fixing the price of gas in the cities of New York and Brooklyn at $1 per 1,000 cubic feet.——An ordinance is before the City Council of Reading, Pa., which seeks to establish a dollar gas rate in that city.——The death of Mr. Edgar Stockbridge Gage, Superintendent of the Consumers Gas Company, of Chicago, is announced. He was in his 41st year.——We are in receipt of a copy of a handsomely bound "souvenir memorandum book" that is being distributed to its patrons by the United Gas Improvement Company.——Another remembrance is from the Stacey Manufacturing Company, which is in the shape of a paper cutter in metal, prettily glazed.

[Translated for the JOURNAL by Mr. Herman Poole.]

Comparative Value of Coal and Coke.

[A paper read by Messrs. Jerome and Audouin before the Belgian Gas Association.]

The general examination of the different branches of the industry of illumination, during the past years, shows that among all the gas business incontestably holds one of the first, if not the first place. The superiority acquired by gas on account of the numerous advantages which result from its use is still more largely increased by the inconveniences presented by the other modes of illumination. The inconvenient and often dangerous use of mineral oils and the still high price of electricity contribute, in spite of all learned demonstrations, to make it appreciated. Several companies having voluntarily, or under pressure of events, modified their price, have still more facilitated the extension of its consumption. But this prosperity of the gas industry can be lasting and real only when the sale of the bye-products follows normally the ascending march of the consumption.

The production of gas increasing, that of coke increases the same, but this increase is not the only cause of the accumulation of stocks of this fuel. We must also attribute it to the employment of coal for heating benches, to the employment of gasogenes which give scope for a notable economy of combustible, and above all, finally, to the sale of coal which is developed in the large centers on account of the high price of coke still maintained at the present day. The accumulation of stocks results principally from neglect or ignorance of the conditions in which coke can advantageously compete with coal. It is considerable to have found a use, both rational and advantageous, for this fuel, but it is very little if other fuels allow more economically the attaining of the same results.

Without wishing to repeat the practical advantages which accompany the use of coke, it seems to us useful to seek, from an economic point of view, its true value compared with that of coal, and from that to attempt to deduce the conditions of sale allowing assurance of regular output. We could base this study neither on theoretical figures nor on those even admitted in practice without verifying them experimentally. We have, then, sought to determine, in a manner at once simple and exact, the calorific effects of coke and coal of different quality and origin most commonly used.

The apparatus, perfectly suited to these determinations, and unquestionably so is the steam boiler, where the utilization of the fuel is of the best, and which allows results being noted easily. We have accordingly made our comparative trials in studying the heating of boilers using coal and coke successively. We are sufficiently supported by the results found to guarantee our conclusions made.

The trials we made with two boilers of the multiple flue type, each rated at 30-horse power, set in the same manner and used alternately. They had a grate surface of 39.4 inches square, and 339 square feet of heating surface.

The tuyeres being placed for heating by forced draft, we have made the trial with nut coal and dust, with gratings formed of bundles of iron, presenting ½ inch of iron and ½ inch of space, these gratings being alternately blown and not blown.

The blowing, employed with the nut coal principally for the purpose of obtaining a regular combustion, was absolutely necessary with the dust and with quantities of fines of different places, the natural draft not allowing us to keep the pressure of 90 pounds, which was necessary while using these fuels.

The mean pressure during all the trials was kept at 90 pounds, and the temperature of the feed water at 104° F. A gauged tank allowed the determination of the water vaporized at any moment. The fuel was

carefully weighed, as well as the cinders and waste produced. In summing up we used for this study all the means of control at our disposal. The figures which we have obtained, while being, above all, practical, are comparable with each other and sufficiently exact, so that we may draw a close conclusion.

The table below gives the trials made with various qualities of coal from different locations:

1. Coal (results obtained in the conditions of the experiment)—

		Cinders. Per Cent.	Steam at 90 Lbs. per Sq. Ft. of Heated Surface per Hour.	Steam at 90 Lbs. per Sq. Ft. per Lb. of Fuel Used.
Lump or egg		8.40	2.281 lbs.	6.160 lbs.
Stove		8.18	2.375 "	7.140 "
Nut	Grate, not blown	16.59	3.086 "	6.460 "
	Grate, blown	14.03	3.522 "	7.470 "
Dust	Grate, not blown.	No test possible.		
	Grate, blown	15.02	2.937 "	7.350 "

The numbers 7.350 lbs. and 7.470 lbs. obtained with the dust and fine coal are a little better than the true figures, inasmuch as they include the quantity of steam caused by the draft. To reach more nearly to the truth, and to show only the utilizable steam formed, we should diminish these numbers by the quantity of steam caused by this forced draft. This proportion of steam determined experimentally reaches 20 lbs. per hour, on the average. The quantity of steam produced per square foot of surface heated, and per hour, 9.125 lbs., or 497.7 lbs. per hour in total, the blowing absorbs—

$$\frac{9.125 \times 100}{497.7} = 1.83 \text{ per cent. of the total steam produced.}$$

The table above then becomes as follows:

2. Coal (under the conditions of the test)—

		Cinders. Per Cent.	Steam at 90 Lbs. per Sq. Ft. of Heated Surface per Hour.	Steam at 90 Lbs. per. Sq. Ft. per Lb. of Fuel Burned.
Lump or egg		8.40	2.381 lbs.	6.160 lbs.
Stove		8.18	2.375 "	7.140 "
Nut	Grate, not blown	16.59	3.086 "	6.460 "
	Grate, blown	14.03	3.458 "	7.334 "
Dust	Grate, not blown.	No test possible.		
	Grate, blown	16.02	2.679 "	7.217 "

From this table one may deduce the practical calorific effect of the different qualities of coal.

If Q is the calorific effect reduced to 32°, q the calorific effect observed, that is to say, the weight of water actually vaporized per pound of combustible burnt, t' the temperature of the freed water, = 104°, t the temperature of the water at 90 pounds pressure, = 319°,

$$Q = q\left(1 - \frac{104}{1{,}082 + 1.937 \times 319^\circ}\right) = q \times .9389;$$

Whence—

3. Coal (practical calorific effects)—

Large size		5.784
Medium		6.704
Fine		6.065
Forced draft	Fines	6.886
	Dust	6.776

From numerous tests conducted in the same manner have been given data for the different numbers of coke. We have summed them up in the following table:

4. Coke (results obtained under the conditions of the experiment)—

	Cinders and Waste. Per Cent.	Steam at 90 Lbs. per Sq. Ft. of Surface per Hour.	Steam at 90 Lbs. Pressure per Lb. of Fuel Burnt.
Grate size	9.71	3.034 lbs.	7.45 lbs.
No. 2	9.50	3.025 "	8.11 "
No. 1	8.75	3.160 "	7.51 "
No. 0	10.00	3.090 "	6.27 "
Fines	11.92	3.385 "	6.82 "

We have obtained, with this fuel, a much more regular heating; the production of steam per square foot of surface heated has been maintained more constantly than with coal.

The calorific effects deduced from this table are the following: ($Q = q_1 \times 0.9389$).

5. Coke—

Grate size	6.994
No. 2	7.614
No. 1	7.051
No. 0	5.886
Dust	6.403

These numbers obtained with the installation above mentioned have been confirmed by tests made by other boilers under different conditions and working.

Mr. Vincotte, Director of the Association for the Inspection of Steam Boilers, has made two tests with coke No. 2, which have given as result a calorific effect of 8.23 lbs. and 8.27 lbs.

If we compare these different tables with each other we see that the calorific effects obtained with coke are superior to those obtained with coal, and we may conclude, therefore, that from this point of view already coke is at least equal to coal.

Such are the practical considerations that we might draw immediately from these experiments.

We will meet coal in manufactories in this state of fines and sometimes dust; among the particular and in the large cities we will meet only the stove, grate, etc. The price varies according to the composition, the mines handling the coal as we handle coke, with this difference that they dispose of the larger part of their fines, while we have only just commenced to use rationally our dust.

Let us take as types of charges for coal the price of Belgian coal of medium quality:

Large coal, greater than 5 inches	$4.27
" " 3½ to 5 inches	4.46
Stove coal, 2 to 2½ inch	3.10
" " 35 per cent	2.33
" " 25 per cent	2.15
Poor coal	1.55

There exist other sorts, allowing the buyers to satisfy themselves, but all may be included in three kinds:

Large coal	$4.46
Stove coal	3.10
Fine coal	1.55

At Brussels these prices vary for the hundred kilogrammes delivered at the house:

Large coal from	$4.90 to $5.25
Stove coal	3.88 to 4.27
Fines	2.33 to 2.53

It is according to this tariff that we should sell coke, weight for weight.

We have established practically that coke yields nothing to coal in calorific power. Yet it is not enough to limit ourselves to this proof and to rely on a similar demonstration to change habits and abolish routine. We must devote ourselves to destroying above all the prejudice which exists against the use of coke. These pretensions are numerous and strongly rooted. We have tried here to combat the most important—that which consists in denying the value of coke as fuel; to destroy this it is necessary to continue the tests and multiply them; from the sole accumulation of documents would come decisive arguments which would convince the most incredulous. The other prejudices are less reasonable and from this fact easier to destroy. Coke is reproached, among other things, with burning out the boilers and to giving birth, by its combustion, to sulphurous products which attack the iron. The first argument can only be refuted by use; to contribute to this denial we will say, for our part, that the two boilers used for the above experiments have been heated, night and day, with coke since their setting up; that is to say, for five years, and that they are absolutely intact. The second argument will not stand examination at all. It will suffice, in short, to recall that coal, during its distillation, loses almost completely all its sulphurous components and that, therefore, coke will always be less hurtful from this cause than coal itself.

In what concerns domestic heating, we should labor above all to spread the usage of apparatus of slow combustion and continuous feed, and that without stopping for the condemning carried somewhat rashly by a certain faculty of medicine, of whom we might ask proofs at hand to support the verdict. We must be able to convince the purchasers that these apparatus give yields of 80 to 90 per cent., while open fires give a maximum of only 20 per cent.

For several years we have met a serious competition with anthracite, of which the price is, it is true, notably higher than that of coke, but which presents the great advantage of occupying for equal weight a volume twice as small. It is necessary, to compete advantageously, to serve to consumers immediately, who are mostly improvident; no sacrifice should be spared to this end. We must finally pursue our study of the application to industrial apparatus of the principal so fecund, that of continuous feed, that we already see more or less happily realized in heating of stoves.

We give below for each quality of coal and coke one of numerous tests made:

Coal.

	Stove Coal.	Grate Coal.	Fines. Grate Blown.	Fines. Grate Not Blown	Dust. Grate Blown.	Dust. Grate Not Blown
Duration of test	8 hours	6 hours	6 hours	6 hours	6 hours	
Mean pressure in pounds	90	90	90	90	90	
Temperature corresponding to the pressure	319°	319°	319°	319°	319°	
Temperature of feed water	104°	104°	104°	104°	104°	
Fuel used, weight (lbs.)	851.4	785.4	1,027 4	1,103	763 4	
Waste produced (lbs.)	50.6	52.4	127.4	76.8	72.6	
Cinders made (lbs.)	17.6	13.6	43.3	42.5	17.6	
Total (lbs.)	68.2	66	177.4	119.3	90 2	
Cinders and waste (per cent.)	8	8.4	16.61	11.7	11.8	
Net fuel (lbs.)	784	719.4	856 7	893.9	673 2	
Water vaporized (lbs.)	6,600	4,840	8,140	6,820	6,160	
Steam at 90 lbs. produced with water at 32° per lb. fuel used (lbs.)	7.260	5.783	7.417	5 318	7.567	
Steam at 90 lbs. produced with water at 32° per lb. net fuel (lbs.)	7.896	6.309	8 919	7.154	8.497	
Steam at 90 lbs. produced with water at 32° per square foot of heated surface per hour (lbs.)	2.288	2.235	3.555	3.148	2 856	
Combustion per square foot of heated surface per hour (lbs.)	.313	.289	.379	.373	.277	
Combustion per square foot of grating per hour (lbs.)	9.901	12.197	15.955	15.725	11.849	

Test impossible.

Coke.

Detail of Experiment.	Stove Size.	No. 2.	No. 1.	No. 0.	Dust.
Time of test	6 hours	10 hours	10 hours	7 hours	10 hours
Mean pressure in pounds	90	90	90	90	90
Temperature corresponding to this pressure	319°	319°	319°	319°	319°
Temperature of feed water	104°	104°	104°	104°	104°
Fuel used, weight (lbs.)	936.6	1,259	1,374.3	1,148.7	1,743
Waste produced (lbs.)	74.8	89.8	89.1	100.9	208.1
Cinders produced (lbs.)	13.2	12.5	9.9	14.3	19.8
Total (lbs.)	88	102.3	99	115 2	227.9
Cinders and waste (per cent.)	9.13	8.12	7.23	9.97	13.07
Net fuel (lbs.)	875.6	1,156.7	1,275.3	1,033.5	1,515 1
Water vaporized (lbs.)	6,920	11,000	11,000	6,960.	11,550
Steam at 90 lbs. produced with water at 32° per pound of fuel used (lbs.)	6.638	8 497	7.511	5.887	6.215
Steam at 90 lbs. produced with water at 32° per pound of net fuel (lbs.)	7.304	8.919	8.093	6.581	7.154
Steam at 90 lbs. produced with water at 32° per square foot of heated surface per hour (lbs.)	3.156	3.056	3.054	2.914	3.206
Combustion per square foot of surface heated per hour (lbs.)	.354	.465	.406	.484	.515
Combustion per square foot of grating per hour (lbs.)	14.63	11.47	12.52	15.28	15.88

Progress of the Electrical Industry in England.

[Address delivered by Mr. A. Siemens, President of the English Institution of Electrical Engineers.]

Mr. Siemens began by thanking the members for having elected him to be their President during the current year, and in doing so said it was only natural that he should remind them of the fact that the late Sir William Siemens was their first President. For this reason he might claim to be the first representative of the second generation of electrical engineers who had been called into separate existence by the founding of the Institution 22 years ago. During this period the Institution had grown from small beginnings to its present flourishing condition, thanks to the ability and energy of its founders and of his predecessors in the chair, who had spared neither time nor trouble to secure for electrical engineers the position to which the growing importance of the applications of electricity entitled them. He then acknowledged the assistance of the permanent staff of the Institution, and the kindly counsel received from the Secretary of the Institution of Civil Engineers, which had often guided the Society in times of difficulty during its early years. The contrast existing in the applications of electricity at the time of the founding of the Institution and at the present time had been so clearly and ably put forward by Mr. Preece in his address last year that it would be wasting time if he (the President) entered into any details to illustrate the progress. On the other hand, it might not be out of place to analyze the various factors which had influenced the development of their profession from the time at which telegraphy was the only important practical application of electricity, until now, when it is called upon to supply energy for an immense variety of purposes. He then proceeded as follows:

I need not recapitulate the reasons which for a long time made the distribution of electrical energy commercially impossible; but when these difficulties had been overcome, and the electrical engineers were ready to supply the public, it was found that, excepting the Corporation of the City of London, there existed no authority in the United Kingdom that could permit the laying of underground mains, and that a special act of Parliament was requisite. To the unsophisticated mind this appeared to be extremely simple, as all that was needed was to extend the powers of the various authorities to whose care the laying of water and gas pipes and of telegraph lines was intrusted, so that they could deal in a similar manner with electricity mains. Some of the electric light companies were of opinion, however, that the same object would be attained if they received powers from Parliament to make agreements with the local authorities, subject in every case to the approval of the Board of Trade, for establishing a system for distributing electrical energy in the various districts; and, in pursuance of this policy, several Private Bills were filed for the session of 1882.

The Government of the day did not consider it to be of public advantage that a limited number of electric light companies should have such roving powers; but they brought in a General Bill with the intention of facilitating and expediting the general application of electricity. With this object in view, powers were to be given under the Bill to the Board of Trade to grant licenses or provisional orders to electric light companies. The license to establish a system of electrical distribution in any district was to be granted to an electrical company who had succeeded in gaining the consent of the local authority, and its conditions were to be settled between the local authority and the company, subject to some general provisions to be drawn up by the Board of Trade, and to the sanction of the Board. In districts where the local authority objected, the electric light company should nevertheless be able to establish itself by means of a provisional order of the Board of Trade; but to obtain this the company had to prove that the majority of the inhabitants of the district desired to have facilities for obtaining electrical energy.

It will be observed that in this draft the license was intended to be the usual way of obtaining power to lay underground mains; and the formalities for settling it were extremely simple. The provisional order, on the other hand, was to be resorted to, in exceptioal cases, as a means of overcoming the objection of local authorities. This is confirmed by the fact that, in the draft, the duration of the license and of the provisional order were equal. These benevolent intentions were, however, thoroughly upset during the passage of the Bill through Parliament; and the Electric Lighting Act (1882), which was the outcome of the discussions before a Select Committee, has given rise to angry denunciations on account of the obstacles which, in the opinion of many, it

was raising to an early introduction of lighting by electricity on a large scale.

Curiously enough, nobody during the passage of the Act, or afterwards, seemed to care much about the fate of the licensing system, which was completely stripped of its importance, and alluded to by the learned counsel on both sides as suitable only for experimental purposes. Following up this train of ideas, the duration of a license was curtailed to seven years. Had the intention of the Government, however, been carried out as at first designed, we should now enjoy in the United Kingdom the same facilities for establishing electric supply systems that have aided the development of the electrical industries so much in other countries, instead of being obliged to apply to Parliament, in each separate instance, at great trouble and expense.

Disregarding entirely this vital alteration of the Bill, another provision was seized upon to explain the failure of so many electric enterprises to which the aid of the public had been invited about that time. You all know that this was the clause giving the local authority the right to buy out the electric company after the lapse of 21 years—paying only the market value of the plant. This agitation was continued until, seven years later, the objectionable clause was modified ; and, in consequence of this alteration, it was said that the confidence of the public in electrical enterprises had been restored. At the same time the system of granting powers by way of a license was practically dropped altogether, and since then the Board of Trade has declared its intention not to grant provisional orders to electric light companies unless they have obtained the consent of the local authority, thereby abandoning entirely the original object of the provisional orders. The ultimate result of all this legislation has, therefore, been to create a number of difficulties in the establishment of distributing systems in the United Kingdom. In fact, the formalities of applying for a provisional order are very similar to those required for a Private Bill; so that practically we are not in a very much better position than before the passing of the Electric Lighting Act (1882).

In order rightly to understand the influence which this legislation exercised on the development of the electrical industry, it is necessary to examine into the character and the number of the applications made to the Board of Trade under these Acts, and to trace how many of them have led to the establishment of distributing systems. Taking first the case of the electric light companies, or, as the Act calls them, encouragingly, "the undertakers," we find that in 1883, 55 provisional orders were granted, all of which have been revoked. In 1884, 3 provisional orders and 1 license were granted, all of which have been revoked. In 1885, 1 license was granted for the lighting of St. Austell ; and this has been put into operation. In 1886, 1 provisional order was granted to the Chelsea Electricity Supply Company. This also has been carried out ; but 4 licenses granted during the two following years, 1887 and 1888, have since been revoked. So that up to the time of the passing of the amending Act (1889), 1 license and 1 provisional order are the sole survivors. These facts clearly indicate that, under the Electric Lighting Act (1882), the undertakers have not succeeded in their object to make electrical energy obtainable as a household commodity. It is, of course, quite another question whether there were not very strong causes of another kind which prevented the powers obtained under the Act from being exercised.

Since the Electric Lighting Act (1882) was passed, a new impetus was given to these enterprises ; and, without examining the result of each year's applications separately, the grand total of the undertakers' efforts is that, since 1882, 138 provisional orders and 15 licenses have been applied for. Of these, 81 provisional orders and 9 licenses have been revoked ; so that 57 orders and 6 licenses are still in force. To this number 2 orders have to be added, which have been transferred from local authorities to undertakers. An electric supply has been established, or the work is actually taken in hand, in 54 cases ; and about 53,000 horse power will be available. On the other hand, of local authorities, a few had obtained powers under Special Acts. The city of London, as mentioned above, had been able to make some experiments in street lighting without any special permission ; but a number of authorities availed themselves of the opportunity given by the Electric Lighting Acts, and obtained 121 provisional orders and 6 licenses up to the end of last year. Of this number, 8 orders and 4 licenses have been revoked or merged in provisional orders; so that 113 orders and 2 licenses granted to local authorities are still in force. But 2 orders have been transferred to undertakers, as mentioned above. Under these powers, 51 electrical systems of distribution, with 35,000-horse power, have been established, or are in course of construction ; while, in almost all the other instances, the intention soon to carry out the work is apparent.

The financial success which has invariably attended the municipal electric enterprises has relieved the rates at the expense of the wealthier classes in a perfectly legitimate manner ; and the more electricity becomes one of the common necessaries of life, the better it is that its supply should be in the hands of the community, and not in those of monopolists.

A strange fact in connection with this subject is that the great majority of the local authorities should have waited until the passing of the Electric Lighting Act (1889) before applying for powers to supply electricity; for it must not be forgotten that their position was in no way affected by the alteration of the Electric Lighting Act (1882). The explanation must, perhaps, be looked for in the exaggerated expectations that were raised by the statements of company promoters in the year 1882, when the most reckless assertions were made as to the results to be obtained by establishing electric systems of distribution. The natural consequence was that the inquiries set on foot by various local authorities in no way confirmed the sanguine estimates that had been dangled before the public to obtain its support ; and the total failure of the electric light companies to carry out a single one of the orders and licenses obtained by them in the years 1883 and 1884, made the local authorities hesitate before they embarked the ratepayers' money in such precarious undertakings.

Fortunately for the progress of our industry, there were some corporations who could be convinced, by the result of their inquiries, that the use of electric light would be very advantageous for a variety of purposes, and that the knowledge and ability of the electrical engineers had progressed sufficiently to make a profitable distribution of electricity from a generating center possible. We have seen that their example has been largely followed ; and there is every prospect of a continuous and ever increasing development of this branch of electrical engineering. To be sure, in foreign countries, especially in the United States, the use of electricity is much more common than here ; but this is the natural outcome of the greater facilities for establishing centers of supply under the laws of the various countries, where the local authorities, in the majority of cases, have the power to make agreements with electrical companies for supplying the district with electrical energy for various purposes.

Another important factor in retarding the spread of the application of electricity in this country is the otherwise very laudable desire of the electrical engineers to show in every new undertaking a distinct advance on its predecessors. In this way the details of construction are undergoing a constant change—in strong contrast to the United States, where the leading manufacturers have their standard sizes of plant and accessories ; these are manufactured wholesale by specially designed machinery, and can therefore be supplied much more cheaply than apparatus specially constructed for each case. At the same time, the whole transaction is greatly simplified by the absence of long negotiations about the construction of the apparatus ; the town which is to be lighted simply specifying how many glow lights and arc lights are to be supplied. This system of working has certainly been instrumental in accelerating the introduction of electricity for a variety of uses throughout the States. But it can hardly be pretended that such a cast iron application of the same apparatus under a variety of circumstances can lead to the most economic results, nor has it been possible to keep up the quality of the work to the English standard.

However much other causes may have contributed to delay the development of electrical engineering, it is clear that the principal one must be looked for in the exaggerated expectations that were raised, either by ignorance or by design, when the general public first seriously thought of regarding electricity as a commodity for every-day use. At that time the promoters of electric companies preached to the public that electricity was in its infancy, that the laws of this new science were totally unknown, and that wonders could be confidently expected from it. There was a short time of excitement to the public and of profit to the promoters ; then the confidence of the public in electricity was almost destroyed, and could only be regained by years of patient work. That the electrical industry was not altogether killed by all these adverse factors is undoubtedly due to the firm scientific basis on which it rests, and to the advantages which the applications of electricity possess as compared with other means for accomplishing the same ends.

In a discourse before the Royal Institution, I had an opportunity of reminding the audience that during the last 60 years the most eminent scientific men have studied the phenomena produced by electricity, and that, in consequence, the laws which govern electric currents were perfectly well known when the supply of electricity on a large scale became commercially possible. Since that time the study of electrical phenomena has been carried on with even greater zeal than before ; and electrical engineering is now in no danger of lagging behind for want

of theories, but is largely aided in its progress by the painstaking investigations carried on in many laboratories, both in England and abroad. While electrical engineering is thus closely allied to physical science, it has quite as intimate a relation to mechanical engineering—in fact, its real progress dates from the time when the close connection of electrical and mechanical engineering was thoroughly recognized; and since then these two branches of engineering have reacted on one another to their mutual advantage.

The contrast between present practice and that of the pioneers of our profession is at once recognized in reading the first papers and reports on dynamo electric machines, where particular stress is laid on the small size and on the low weight of a dynamo to produce a given result; but the necessity of having the moving parts durable, and of not always working the machine up to its maximum power, was completely ignored in the desire to produce a large effect with the minimum expenditure of materials.

Having alluded to the progress of mechanical design as shown in the modern dynamo, the President went on to say that by far the most important connection between mechanical and electrical engineering was the transmission of power, which had lately acquired so much prominence. The success of electric tram lines had undoubtedly contributed to direct general attention to the transmission of power by means of electricity; but great care would have to be exercised, so as not to part in a direction which could lead to no practical results. Dealing further with this subject, he said: It is in the distribution of power that mechanical engineering is of the greatest influence on the successful application of electricity. It is, of course, a purely electrical problem to deliver your current either at a standard voltage, or in a constant quantity, at all points of your network of mains; but the application of the motors to the work they are required to do, and the determination of their dimensions, involve principally mechanical considerations. How much there is still to be done in this respect was made apparent during the discussion of Professor Forbes's paper on the proposed utilization of water power at the Niagara Falls. Although the prevailing opinion seemed to be that for transmission to a great distance alternate currents only can be utilized, I believe that of the actually established long distance transmissions, the greater part are worked with continuous currents. No hard and-fast rule can apparently be laid down that either the continuous or the alternate current should be preferred in all cases where power has to be transmitted to a distance; and, in judging of the merits of the two systems, the proper conclusion can only be arrived at if the commercial aspect of the case is allowed to decide the question. The installation of rotary current motors at the Frankfort Exhibition, driven by the water power at Lauffen, was undoubtedly an engineering success, and served very well for the purposes of an exhibition. But nobody has attempted to do every day work on the same lines, for the simple reason that it would have been much cheaper to produce the power in Frankfort by steam engines than pay the commercial interest on the outlay that had been necessary to establish the transmission from Lauffen. The generating plant of this installation is now used for the lighting of Heilbronn, and there are a few other instances where rotary currents are used for long distance transmissions. But, as I said just now, it would be wrong to generalize by preferring either the one or the other method of transmission in all cases. Another great field for electric motors has just been opened by their introduction for distributing power in works, with a view of abolishing shafting, leather belts and other intermediate gearing, and of giving each lathe or other tool an independence that cannot be attained under the present system. A most interesting paper on this subject was read by M. Castermans before the Society of Engineers in Liege in August, 1892, in which he compares in detail several proposals for distributing power in a new small arms factory, that has since been erected at Herstals. The result he arrived at was that, with electrical motors, he could exert on the working machines 70 per cent. of the power generated by the main engine, while the next best other method gave only 63 per cent, when the shops were working at their full capacity. In these problems, again, mechanical engineering questions decide whether the application of electricity is justifiable, and it is quite apparent that an electrical engineer requires to be well versed in a variety of subjects if he wishes to keep in the front rank.

The President next dealt with the effect of the altered system of education of the present day in the production of men capable of exploring the untrodden fields of applied electrical energy. In drawing his address to a close, he said the influences which had shaped the course of electrical engineering might well engender in those engaged in it the hope of an ever increasing activity and of an ever growing importance of the applications of electricity; but it must not be forgotten that they could only succeed if they understood how to adapt their work to practical requirements without losing sight of scientific laws. For this reason nothing could further the interests of their profession more than a free and frequent interchange of ideas between the engineers, who carry out the practical applications, and the scientific men, who investigate the nature of electricity. He concluded by saying that in the past the Institution had been the arena in which many subjects had been thus discussed to the advantage of everybody concerned; and it was the duty of all the members to contribute, either by reading papers or by criticising those submitted by others, to the development and to the ever increasing importance of the organization.

Partial List of Fires Caused by Electricity, for a Stated Period.

The following list of fires, traceable to electricity, for the period between November 20, 1893, and January 1, 1894, was compiled by Mr. W. H. Merrill, electrical inspector of the Chicago Fire Underwriters' Associations, from reports submitted by the various tariff associations:

Flexible cord in show windows. Wires back of socket short circuited by jerking of a flexible cord from careless handling of an attachment plug by a window dresser. A lot of loose cotton, with which the window had been trimmed, was ignited. Loss $50,150.

Incandescent lamp in show window, on pendant fixture. Lamp would not burn, and thinking that it had become unscrewed, occupants of the store tried to twist it up tighter. In doing so they short circuited the socket, a portion of which blew out through the shell and ignited bunting and window curtains. Loss not given.

Incandescent lamp in show window. Sable fur wound about lamp socket. Loss $40.

Miniature trolley road in show window. Car jumped track and spark ignited cotton. Bad fire ensued.

Wooden hanger board of arc lamp. Loose connection. Series arc circuit. (Two fires. Loss small.)

Wooden cut-out boxes. Series arc circuits. Located outside buildings. Boxes burned out. Six of these fires reported. No damage in any case except to boxes and wires.

Wood base cut out switch controlling series incandescent lights on arc circuit. Flame of arc on opening switch set fire to wooden base. Extinguished. (Two fires. No loss.)

Wooden hanger board of arc lamp. Series arc circuit. Vicious flame on opening switch. Set fire to board. Cause of arcing, defective operation of cut-out. No loss.

Sparks from arc lamp unprovided with spark arrester. Clothing stock damaged. Loss $443.

Arc lamp set fire to awning by assured covering opening in awning where lamp was suspended. Damage trifling.

Broken globe of arc lamp. Sparks ignited cloth in tailor shop. Cloth and wooden table burned. Loss small.

Wooden encased automatic rheostat stopped half way, leaving two or three coils in circuit, causing them to become red hot and setting fire to back of and above rheostat. No damage to building.

Wooden encased rheostat left partly "on." Coils overheated. Rheostat burned. 500 volt circuit. No loss to building.

Electric flat iron used for pressing silk garments. Starting point of this fire was found to be near a table on which the iron was left the night of the fire. Table entirely consumed. Switch found turned "on" morning after the fire. Fire started at 10:21 P.M. Loss not stated.

Cross between motor and call bell wires. Loss $50.

Cross between telephone and trolley wire. Several telephone instruments burned out. Switchboard in exchange set on fire. Loss small.

Cross between three telegraph wires and trolley road feeder wire. Telegraph wires welded together. "The current entered a railway telegraph office 4 miles distant, and also another on the same line 30 miles distant, causing fire in both places at the same time. At the first place the current melted all the metal work on the switchboard. The presence and prompt action of the operators at both places prevented no doubt two serious fires."

Cross between telegraph and arc light wires. Loop in telegraph line short circuited a portion of arc circuit. Fuse in telegraph switchboard blew out, but the binding posts were so near together that the arc continued for some seconds until the cross left the line. Switchboard was ablaze, but discovered in time to prevent any material loss.

Cross between telephone and arc light wires. Loss $48,000. Cause cannot be proven. Conditions and indications point to above.

Cross on wires connecting to elevator motor. Hose turned on. Motor ruined. No other loss.

Cross between telephone and arc light line caused by arc light wire breaking and falling on telephone wire. Telephone closet burned out. Loss small.

Switchboard in telephone office. Caused by breaking of a guy on electric light pole allowing the pole to lean over, bringing the wires near the telephone wires, and then sleet storm causing the wires to sag so that contact was made and switchboard burned out. Damage confined to switchboard.

Cross on incandescent lighting wires in concealed work between floors. Alternating 55 volt circuit. Defective insulation. No loss.

Uncovered fusible cut-out. Twelve-ampere fuse 110-volt circuit blew out and snapped 15 feet, setting fire to the frayed end of a rope. No loss.

Uncovered fusible cut-out. Twenty-ampere fuse 110-volt circuit in main cut-out on basement ceiling blew into bale of sheet paper. Bale burned. Loss small.

Fusible cut-out covered with sheet mica. Same cut-out, location and conditions as above. Happened two days after first accident. Fuse metal blew through mica cover and ignited more bales of paper. (Cut-out is now encased in fireproof box.)

Uncovered cut-out. Iron wire used for fuse metal melted. Hot globule fell into bed beneath and burned mattress. Fifty-volt alternating system.

Distance between terminals of 500-volt cut-out too small. Ordinary 110 volt porcelain base cut-out inserted in mains of 500 volt power circuit. When fuse blew arc was maintained across terminals. Woodwork and wall paper adjacent charred. Loss nominal.

Concentric wire in tube. Tube broken. Loss small.

Two wires in a tube. Fifteen-ampere circuit. Nail driven through tube between the two conductors injured insulation. Loss, $5.

Bug cut-out in fixture canopy ignited rubber tape around it. Loss, $30.

Chandelier cut-out. Workman replaced fuse and neglected to inclose the new one with insulating material. Fuse metal came in contact with grounded portion of fixture above insulating joint. Heat ignited insulating covering of wire. Attendant turned double pole switch at building entrance and extinguished fire. Ceiling blackened by fire and smoke. Practically no loss.

Horseshoe cut out in fixture canopy grounded to gas pipe, formed an arc, melted a hole in gas pipe and ignited the gas. Around the gas pipe, for about 18 inches square, asbestos paper had been placed, and this delayed the spread of the fire until it was discovered and the fire tinguished. Damage slight.

Two slight blazes caused by wires short circuiting or grounding in fixtures.

No insulating joint on fixture. Flexible cord grounded to fixture by lightning discharge. Hole burned through pipe and gas ignited.

No insulating joint. Same as above, except cord was consumed without burning pipe.

No insulating joint. Lamp cord on chandelier grounded. Insulation between primary and secondary coils in transformer broken down. Primary current on secondary circuit. Small loss to contents.

Contact between motor wire and gas pipe. Hole burned through pipe. Gas ignited.

Breaking of incandescent lamp globe in gasoline store room. Vapor ignited and 10 gallons gasoline burned, together with contents of fireproof vault.

Defective flexible cord in paint shop came in contact with and ignited spirits of turpentine. Extinguished without loss.

Wires in moulding under leaky roof. Alternating system, 55 volts. Extinguished without loss.

Water used in scrubbing floors leaked through to concealed work done with underwriters' wire and wooden cleats. Current short circuited. Direct current 110-volt system.

Dampness from heavy rain short circuited waterproof wires passing through inside partition without bushing other than tape; separated about 2½ inches. Woodwork charred to the depth of about 1 inch.

Jet of steam from steam pipe caused short circuit of wires in moulding. Loss small.

Wires through floors in paper tubes in cold storage house. Dampness from melting of ice on outside of pipe caused partial short circuit. Damage small.

So-called "hard rubber" tubing through floors encasing rubber covered wire. Series arc circuit. Deterioration under action of water caused burn-out. No loss.

Bell wire tapped to incandescent lighting 50 volt alternating circuit by employees in building. Cotton and paraffine insulating covering ignited. Loss considerable.

Resistance used in connection with two arc lamps on constant potential system suspended 8 inches below wood ceiling ignited woodwork by overheating. Loss small.

Broken bond between rails of trolley road. No supplementary return wire used. Arc formed and set fire to wooden bridge.

Wooden base used for fusible cut-out inclosed in wooden cabinet attached to frame partition burned out. Loss small.

Unsoldered joint in livery stable held against sheathed ceiling by wooden cleats. Ceiling partly burned. Loss not stated.

Burn-out of arc lamp on test run. Lamp to run on 45 volts connected to 110-volt circuit. Small loss to building.

Difference of potential between gas and water pipes in dwelling house due to trolley road employing ground return. Soldered connection to gas meter burned through and gas ignited. Floor timbers burned. Loss small.

Breaking down of insulation between primary and secondary coils of transformers. Several small burn-outs resulted in different parts of secondary circuit, in separate risks. Losses all small.

Burn out in street service of underground system. Seven feet of service tube and conductors melted. This accident is noted for reference in connection with Rule 16, c.

Three fires are reported, in which the causes are presumably due, respectively, to a dynamo, a motor, and a grounded 500-volt power circuit, but conclusive evidence in each case is lacking. Losses all large.

Nine "burn-outs" on series arc circuits to metal signs, structural iron work or awning frames are reported. All outside buildings. Losses all small.

Electric street railway power station. Caused by dropping an oil lantern. Loss total.

Electric light station. Fire started in vacant ell. Cause unknown; evidently not from electricity. Considerable water damage to contents.

A fire occurred in an electric light station a few months ago. Building had large frame extension on roof of lantern construction. Fire caused by series arc circuit wires leading out of this extension. It burned for some time before alarm was given, the employees of station meanwhile trying to extinguish it. Stormy night and high wind. Loss practically total.

The following actions are reported:

Philadelphia Fire Underwriters' Association—A demand for guard wires and hand switches along route of trolley roads.

New Hampshire Board of Fire Underwriters—The adoption of provisional rules to govern cooking and heating circuits and apparatus, awaiting the action of the Underwriters' International Electric Association.

City Electrical Inspection Department of Chicago—The adoption of the rules and regulations for electric light and power wiring recommended by the Underwriters' International Electric Association.

The next summary of fires caused by electricity will be published about April 10 next.

Electric and other Systems of Hoisting.

Mr. George A. Goodwin, in a paper recently read by him before the Society of Civil Engineers (England), on the "Merits of Steam, Electricity and Water for Hoisting Work," thus sums up his determination of the advantages and disadvantages of each of the named methods:

Steam—Advantages.—(*a*) The first cost of installation is less than for hydraulic or electric plants.

(*b*) In the case of the cranes only, as they supply their own motive power, they cannot be affected by the failure of a main or the machinery at the power station, as in hydraulic or electric.

(*c*) The installation can be added to gradually at a less initial cost than with hydraulic or electric plants, where the power station should be sufficiently large for the maximum duty likely to be required from it.

Disadvantages.—1. It is slow in action compared to hydraulic or electric power, working only at about half the speed.

2. Each crane generating its own power; they are more costly to work than hydraulic or electric cranes, where one generating station supplies power for the whole plant.

3. The drivers of the cranes have to be men of above the average intelligence, and fairly good mechanics.

4. The consumption of coal and fresh water is considerable, and if the cranes and capstans were not required to work, but kept in a state of readiness, more coal and water would be consumed than for the hydraulic or electric plant, if they were kept idle in a similar manner, there being so many more boilers to keep under fire, viz., one to each crane and one stationary, one to each group of capstans.

5. The cranes are noisy, and owing to great speed have much vibration, with consequent wear and tear, entailing a high cost for repairs, and danger of fire, as the boilers are liable to emit sparks with the smoke.

6. Generally, they require to be supplied with coal from a store, entailing labor and creating dirt. The machinery is more complicated than hydraulic, and partly exposed to the weather, in addition to which its wear and tear is considerable, and there are possible risks of explosion.

7. The cost of working is higher than hydraulic or electric.

Hydraulic—Advantages.—(*a*) The power for working the plant being generated at a central station, the cost of working is reduced to a minimum, there being only one set of boilers to fire, and practically no fresh water is required beyond a few gallons daily.

(*b*) The machinery is quick in action, at least twice the speed of steam, and speed for speed for lifting, compared with electric, has a much less wear and tear, the cranes being capable of working 60 lifts per hour, or more if desired. At the trial of the large hydraulic 35 cwt. cranes made for the Tillbury Docks, 81 working lifts were made in 47 minutes, in which the goods were lifted out of a boat, slewed round, and landed on the quay.

(*c*) Only one driver and stoker is necessary; a lower and cheaper class of men can work the cranes and capstan than is the case in steam-driven ones. It is, however, necessary to have one skilled mechanic to generally look after the work.

(*d*) If the plant should be required to stand idle for any length of time, only a very small amount of fuel would be consumed.

(*e*) Generally the machinery is noiseless, simple, clean, all protected from the weather, and has not much wear and tear; the cranes can be easily moved along the quay.

(*f*) Besides the hydraulic power being used to work the machinery already referred to, it would be available for elevating purposes in neighboring warehouses and for the extinction of fires by means of injector hydrants.

(*g*) The cost of working is less than by steam, but about the same as by electricity, but the upkeep is less than either.

Disadvantages.—1. The initial cost is greater than for steam and slightly more than for electric cranes.

2. In the case of a breakdown at the power generating station, or failure of the mains, all the plant would be temporarily stopped. Although the author mentions this, he does not consider it at all likely to occur, nor does he know of any case where this has taken place; it is only necessary to have all details made amply strong.

Electric—Advantages.—(*a*) The power for working the plant being generated at a central station, the cost of generating is reduced to a minimum, etc., the same as in hydraulic.

(*b*) Machinery is quick in action, though not quite so quick as hydraulic.

(*c*) Only one driver and stoker is necessary, etc., the same as in hydraulic plant.

(*d*) If the plant should be required to stand idle, etc., the cost is the same as for a hydraulic plant.

(*e*) Generally the machinery is fairly noiseless; it is cleaner than either steam or hydraulic, and can easily be arranged to be self-propelling along the quays.

(*f*) The power can also be used for lifting purposes in neighboring warehouses.

Disadvantages.—1. Speed for speed of lifting, there would be more wear and tear than in the hydraulic system.

2. In the case of breakdown at the power generating station, or the failure of a main, all the plant would be temporarily stopped.

3. The drivers of the cranes would have to be men of above the average intelligence.

4. The upkeep would be slightly more than in the case of a hydraulic plant.

The author concludes that, all things considered, the hydraulic system is the most satisfactory one, and considers that more improvement will be effected in this system than in steam or electricity.

Dangerous Occupations.

Some admirable reports have been submitted to the English Parliament by the Departmental Committees appointed to "inquire into the conditions of labor in dangerous occupations," two of which relate to lucifer match works and to chemical works, both having been prepared by the same Committee. Referring to the former, the Committee recommend that it shall not be lawful to carry on a lucifer match factory, where yellow or white phosphorus is used, except (1) the processes of mixing, dipping and drying are carried on in apartments separate from other portions of the factory; (2) that fumes from these processes, and from the boxing department, are not allowed to enter the rest of the factory; (3) that efficient means of ventilation, both natural and mechanical, are provided; (4) that conveniences for the employees' washing both hands and faces before every meal are afforded, and that their regular use is enforced; (5) that means for rapidly extinguishing ignited matches in the boxing departments are furnished to each worker. Further, it is stipulated (6) that if any person employed in the works complains of toothache or of swelling of the jaw, he shall be immediately examined by a medical man at the expense of his employer, and if any symptoms of necrosis are present the case shall be reported to the factory inspector; (7) that no person having suffered from necrosis shall resume work without a medical certificate of fitness; (8) that no person shall work in the processes of mixing, dipping, drying or boxing after the extraction of a tooth without a medical certificate that the jaw is healed. The members of the Committee are somewhat divided in relation to one point. They all concur in the suggestion that a certifying surgeon shall make a monthly examination of the workers at a factory, with power to order temporary suspension, or change of work, for any person showing symptoms of incipient necrosis. They also agree that he shall enter the dates and results of his visits in a register, but four out of the six members add that the register shall contain the names and addresses of all workers in the mixing, dipping, drying and boxing departments, with the date of their commencing and leaving employment. This provision is that the cases may be watched and their history learned. Finally, the persons employed are reminded that if they fail to comply with the special rules, they are liable to be fined $10.

There is nothing unreasonable in these rules. Common sense would dictate the separation of processes giving rise to noxious fumes from those of an innocent nature, and also the necessity of ample ventilation. The provision ot medical inspection and assistance for combating the painful and serious disease of necrosis of the jaw, which is induced by the fumes of phosphorus, is only equitable, while the expense need not be more than a very small proportion of the wages bill, as medical men make easy terms in such cases. The monthly inspection is a somewhat more serious matter, seeing that under the existing rules necrosis has almost disappeared, and that it is scarcely possible for it to be set up without preliminary toothache, which would bring the case in its early stage under the attention of the medical man.

In chemical works there are no females employed, and very few boys, so that Government interference is not required on account of the helplessness of the workers, although it may be on account of their indifference to the risks they run, or from their lack of care in making use of appliances calculated to ward off the dangers by which they are surrounded. The inquiries are doing good in bringing to light the principle that when an individual is harmed the State suffers an injury, for which it may exact a penalty, and that it is no defence to plead that the hurt was caused by the person who suffered it. Everyone recognizes this in the case of attempted *felo de se*, and the truth of it in smaller matters is being enforced by the rules which are being drawn up for the guidance of men, as well as of masters, in various dangerous occupations.

The most trying of all processes in chemical works is the emptying of the Weldon chambers, the floors of which are covered 4 in. to 6 in. thick with bleaching powder—the so called chloride of lime—which gives off chlorine gas immediately it is stirred. The packers wear respirators, called muzzles, made of 30 folds of damp flannel, bound tightly round the mouth, chin and neck, to insure that there shall be no crevices along which the gas can creep without passing through the fabric. Inspiration takes place through the respirator, and naturally puts on the muscles of the chest an enormous strain, which shows itself in redness of the face and profuse perspiration. Exhalation takes place through the nostrils direct into the air. In addition, goggles are worn to protect the eyes, and the skin is greased to save it from the burning action of the lime dust. Neglect of precautions causes men to be "gassed," and even with the greatest caution this result cannot be always avoided. No one who has ever had an accidental whiff of dilute chlorine will need to be told that gassing is a most painful experience, bringing on violent coughing, and possibly inflammation of the throat and bronchial tubes. The packers work very short hours, and get capital wages, their hours, under the United Alkali Company, being 30 per week, and the pay $17.12½. Strong men seem to be able to follow this vocation without injury; one witness was most emphatic in stating that his health had improved under it, and that he desired no change. Naturally a man likes to take full advantage of his physical ability, especially when he is

adequately recompensed. The very conditions under which the process is carried on—30 hours' work a week, of which only one half are spent in actual toil—show that it is most laborious, and that but few men can, or will, follow it. Weak-chested people fare badly in alkali works; witnesses came forward to say that they were constantly made ill by getting accidental whiffs of chlorine, or hydrochloric acid, as they moved about the yards, or attended to their duties.

The Committee have made experiments in connection with respirators, and they report that if they are moistened with a solution of sulphite of soda, the chlorine becomes converted into hydrochloric acid, which is readily absorbed by the moist fabric, while the gas itself is only sparingly soluble, and much of it passes through. With this method of working a thinner respirator may be used, adding to the comfort of the wearer. Much also may be done by providing the chamber with numerous doors to enable the gas to get away freely, and by reducing its amount to the standard required by the Alkali Act, before the doors are opened. The evidence showed that in works having plenty of free spaces and good means of ventilation the men suffered less than in those which are cramped. It is, however, to the production of mechanical means of collecting and packing the powder that the Committee look for a lessening of the evil, and they give accounts of several plans that are under trial. No doubt the matter is quite feasible if the necessary money be spent over it; unfortunately, the alkali trade is always on the brink of ruin, and capital expenditure is not popular with it.

In the salt cake (sulphate of soda) department the men suffer from leakages of hydrochloric acid, many of which could be avoided if the repair of the plant were more regularly carried on. They meet them by keeping a rag between the teeth to condense the acid, but this causes the destruction of the teeth. One of the witnesses, by no means old, said he had not a tooth in his head. The hours are long—11 and 13 hours' shifts—but there are intervals when the men can snatch short rests. There are also occasional leakages of sulphurous and nitrous fumes in the vitriol department, but these are not only preventable but are breaches of the Alkali Act. In the caustic soda department the splashes of liquor produce sores, and when they fall into the eyes may occasion blindness. The Committee propose that the caustic pots shall be of such construction that there shall be no footing on the top or sides of the brickwork, and that dome shaped lids shall be used where possible. They also suggest that syringes and wash-bottles shall be kept in covered boxes close to the pots, in order that the caustic liquor may be immediately washed out if it splashes into the men's eyes. In the chlorate department the clothes of the men become impregnated with chlorate of potash, which is most inflammable. This danger can be met by the provision of overalls.

Working among bichromate of potash must be a very painful experience. All the men engaged where dust is prevalent, more especially between the furnaces and the dissolving tank, have either perforation of the septum of the nose, or have lost the septum altogether from ulceration. Many also suffer from what are called "chrome holes" on their hands and arms. These are caused by liquor or dust acting on broken skin, or by the handling of crystals. It is not possible to alter the nature of the material, or to prevent entirely the evolution of dust, but the evil may be palliated by the use of respirators and by good ventilation. Personal cleanliness on the part of the workmen will also do much, and to encourage this lavatory accommodation is needed in works. The action of respirators can further be improved by wetting the absorbent material with a solution of bismuth, the result being that an insoluble compound of bismuth and chromic acid is formed.

The public are from time to time shocked by hearing of men in chemical works falling into vats of boiling or caustic liquor. This class of accident is evidently avoidable, and the Committee recommend that every uncovered pot or pan containing liquid of a dangerous character shall be so constructed as to be at least 3 feet in height above the ground or platform; those already in existence shall be securely fenced. No unfenced planks or gangways are to be placed across such pots or pans. This is most necessary, for, however expert men may be, it is folly to carry their lives in their hands always. Some day a foot trips, or the sight swims for an instant, and immediately death in one of its most horrible and painful forms seizes its victim.

It is fairly easy to devise remedies against such dangers as unfenced pans and gangways, and also to enforce their adoption. But it is more difficult to guard against the insidious effects of dust and fumes. These do not strike a man down suddenly and send a thrill of horror through his companions. From week to week they cause no perceptible change in health, and it is only when a review is taken over an extended period that their ravages can be properly appreciated. Under such circumstances irksome precautions are enforced with difficulty. To work through a long summer day in a respirator is no trifling business, and the wisest of men would feel inclined to put it aside. Even ventilation is hard to bear, although its advantages may be undeniable. When it is of the vigorous sort required to carry off dust in a chemical works, it is very likely to produce colds and attacks of excruciating toothache, which are very much more obtrusive than the ill effects the ventilation is designed to prevent. It is easy to call workmen ignorant and stupid because they often prefer present comfort to their ultimate well being, but, in this respect, they merely follow the practices of many who by birth and education should be their superiors. Medical men tell us that half the bodily ills of the middle and upper classes result from neglect of hygienic rules. It is not that the laws of health are not recogn zed, but so many exceptions are made that in the long run the rules are oftener broken than observed. If this be so under conditions of ease and comfort, how much more likely is it that the same practice should obtain where life is passed in hard toil among painful surroundings. The Committee point to the best remedy when they suggest a shortening of the hours of labor. Men working 70, 80 and more hours per week, as some do in the chemical trades, have no mental energy left to enable them to bear added discomfort for the sake of their health. Life is one long task, and all its energy is required to get through the daily toil, leaving nothing to be expended on care for the future.

Foreign Competition in Oil.

By Mr. W. C. Ford.

There is one American product which is meeting severe competition in foreign markets, and a competition, too, that has told adversely in many directions. The success of its only rival has been due to the natural protection of distance, the advantage that arises from the propinquity to market. While the exports of petroleum in the form of illuminating oil have shown a steady increase from year to year, with occasional fluctuations, yet the direction of the trade in this article has changed materially. Countries once good customers have diminished or ceased their demands. For example, Austria Hungary, taking annually from 15 to 23 million gallons, has almost ceased her imports since 1887. France, never a large direct importer of the refined oil, took an unusual quantity in 1893 (8,161,023 gallons) more than her imports in any one year since 1871. The highest import in that period having taken place in 1887, when 4,913,742 gallons were taken, in itself a very large import. By a treaty arrangement entered into by France and Russia, the concessions of which are temporarily granted to the American product, a differential tariff duty is fixed for crude and refined petroleum. The effect of this arrangement, unless it is made to apply permanently to the American product, will strongly favor the import of the Russian article, and so result in a diminution of the French market for American oil. Russia has practically ceased to be a customer in American oil, more intent upon fostering her own industry. So, also, the direct exports to Spain have come to an end, while Gibraltar has ceased to be the importer of the millions of gallons that she used to be, undoubtedly oil taken on Spanish account. Turkey in Europe must obtain its supplies from the neighboring Russian oil field, as its imports of oil from the United States have practically ceased.

The imports of Germany and the Netherlands are also much diminished in quantity, and only Italy, Norway and Sweden and the United Kingdom give evidence of a steady increase in the demand for the American product. The position of American illuminating oil in Europe has materially changed since 1871, as well from the competition of the Russian oil fields as from a desire on the part of some nations to refine in their own establishments.

In other parts of the world there have occurred the same changes, but without the element of local interest leading to restriction of imports with the object of building up a local refining industry. It would be well to glance at the effect of Russian competition in British India, a competition that has been in a measure successful through the advantage of propinquity to market possessed by the Russian fields. In 1887 and 1888 the imports of petroleum into British India were 31,412,000 gallons, and in 1892 they were 58,109,000 gallons, the general tendency being for the mineral oils to supersede the vegetable oils used by the peasantry. Within the five years Russian oil has been introduced into India and gained an important position, and being of good quality and cheaper than the American oil, if for no other reason than the lower freight on the Black Sea than from our Atlantic ports, it is not improbable that the American product may be driven out of the market. This would practically mean the nearly complete cessation of any direct

trade of the United States with British India, for 92 per cent. of our exports to India consist of petroleum.

As a matter of curiosity, the first import of Russian oil into India was noted in 1886–1887, when about 1,500,000 gallons were imported. In that year 29,000,000 gallons of American oil were imported, and on this showing the imports of American oil have actually decreased, and the entire growth of the Indian demand has been absorbed by Russian oil interests. Price, Russian, 12.3; American, 12.2.

Few countries of Europe admit petroleum free of duty. These few are Sweden, Norway, Belgium and the United Kingdom. Germany admits mineral oil for industrial purposes or for refining, but not intended for manufacture of illuminating or lubricating oils. Under certain conditions and under official control it is free. A few countries have a uniform rate of duty for all grades of mineral oil, not discriminating between the crude, refined, heavy or lubricating oils. Russia imposes a duty of 1 ruble the pood, a duty that is merely prohibitory, amounting as it does to $2.45 a cwt. Turkey imposes a general duty of 80 per cent. ad valorem. Greece is peculiar in that it prohibits the importation of petroleum oil and levies a duty of $4 a cwt. on other mineral oils. The tariffs of France and Spain are designed to favor a domestic refining industry.

Large as have been the increased exports of paraffine and paraffine wax, they have been monopolized to a great extent by the United Kingdom. Germany has proved the only competitor, gradually increasing its imports until in 1892 it took $\frac{1}{16}$, but in 1893 has declined to $\frac{1}{25}$. In the English market there is no competition with the American product. Apart from a small quantity, 20,049 cwt. from Burmah, the only other item of importance is an import of 7,050 cwt. from Germany. Of a total import of 552,572 cwt., the United States supplied 525,024. The German returns do not give the imports or exports of paraffine separately, including that article with stearine.

Selection of Anthracites for Water Gas.

By Mr. C. R. Collins.

In practice, the question is not always how to select the best coal for generator work, but how to attain economical results with a coal which may have been chosen for other considerations than quality alone. In the modern methods of gas production from anthracite fuel the improvement of the mechanical details of generator design have almost reached their limit. But with this advance in constructive art, giving as it does absolute control over the conditions entering into the operations of water gas apparatus, we have not attained to the limit for economical use of fuel. By this is meant the economical combustion of coal in the generator without consideration of the many possibilities for recovering wasted heat in the operations following that of the generator. A fair average of present practice is to subject all grades of coal to like conditions of blast and gas making, whereas these conditions ought to vary for each quality and size of coal used. In small plants improvement can be accomplished by a conscientious system of trial and error, while in plants of greater capacity, where the coal consumption exceeds 500 tons annually, resort should be had to definite and exact methods.

The operator of a blast furnace is guided in his work by first ascertaining the exact make-up of the materials entering into his special art. From an analysis of the fuel and the ore proportions and combinations of each are regulated, and the heats of his furnace are controlled so as to effect results in final product of slag and pig that he is enabled to predicate even before the furnace is put in blast.

The necessity for selling the product of the generator at still lower prices will lead our profession to like refinement of methods. An intelligent consideration of the precise nature of the coal selected, and a knowledge of the condition and means for supplying blast and steam, would effect a saving in nearly every plant where water gas is manufactured. In undertakings involving the use of great quantities of materials it seems inexpedient to depend upon the old process of trial and error for their economical utilization when the crucible and pipette reveal, promptly and definitely, facts that we usually grope for in the dark.

In order to demonstrate the feasibility of prescribing operating conditions from a knowledge of a coal's constituent parts, about 25 different grades of anthracites were selected and analyzed, and the results obtained with each coal in daily working of a water gas apparatus. It has been impracticable, from lack of time, to compile these results, and to present them in the manner originally intended. Some questions of general interest may, however, serve to open the subject, and these will be briefly discussed.

The anthracites used are almost wholly from the mines of Pennsylvania, although beds exist in Colorado, Canada, New Mexico, and Rhode Island. The Pennsylvania anthracite distributed through three valleys or basins represents so many different grades of coal, "differing in their chemical and physical properties, though in many instances the chief distinction is that they reach their market by certain transportation routes," becoming Lehigh or Schuylkill, according as they have been shipped, via the Lehigh or Reading railroads. The coals are correctly designated as Lehigh, Schuylkill, or Wyoming, from the names of the three basins in which they are found.

The Lehigh basin furnishes the hardest, cleanest and purest anthracite, characterized by dense structure and little volatile matter. The Schuylkill basin furnishes the next hardest, but it is generally a dirty coal, the veins being seamed with slate and earthy matter.

The Wyoming basin furnishes a still softer grade, characterized as a free burning coal on account of its greater proportion of volatile matter.

The mining engineer recognizes these coals either as hard, dry anthracites, or as semi-anthracites, and has made a classification based on their fuel ratios—*i. e.*, the proportion of fixed carbon to volatile hydrocarbon $\left(\frac{\text{C.}}{\text{V.H.C.}}\right)$ calling such as bear a ratio from 100 to 12 hard, dry anthracites, and such as bear a ratio from 12 to 8 semi-anthracites. The various sizes of coal brought to market which are available for generating work are:

(1) Lump coal, or the largest unbroken pieces as they come from the mine.

(2) Steamboat coal, or those pieces which pass throogh a screen in which the bars are set 4 inches to 7 inches apart.

(3) Broken coal, or such lumps as will go through a 4-inch mesh and over a 2½ to 2¾ inch mesh.

(4) Egg coal, being the pieces that go through a 2½ to 3¼-inch mesh, and over a 1½ to 1¾-inch mesh.

If an anthracite is to be selected for generator use from a superficial examination of sample shipments, the purchaser may be guided by a consideration of the following general indications:

General characteristics, fracture, etc.
Size.
Specific gravity.
Ash and clinker.

(1) The hard, dry anthracites are to be preferred, and are to be distinguished by a gnarled, dense structure, exhibiting a dull and imperfect metallic luster. Such coal is invariably hard and clean burning, and will not break up under the trying conditions of forced blast. Hence the fire is kept open throughout, each lump burning uniformly and gradually without splintering. It also contains the greatest amount of fixed carbon and the least inert matter—properties which not only promote perfect combustion, but favorably affect the cost of manufacturing labor, in that there is required a less gross amount to be charged into the generators, and less waste to be withdrawn at the grate.

The fracture of all anthracites is lamellar parallel to the bed of deposit, and choncoidal in cross section. That coal which comes to us in approximately cubical blocks, free from the long, flat pieces of "slaty" fracture, is preferable, because it gives greater possibility for maintaining a uniform condition of fire in the generator, keeping a freer passage for blast and steam, and a less obstructed channel for the ash to work through, than can be obtained with the flat pieces, which pack closely.

Observation will detect the presence of bone or slate, and sometimes sulphur, but judgment passed hastily may be misleading, as some of the densest and hardest coals have a dead luster often mistaken for slate, and the white flakes seen throughout some lumps, interstratified with the coal, may be either sulphur in combination with calcium or a carbonate of calcium.

(2) In the selection of coal the size is an all-important factor, and is sometimes governed by the size of the generator. In every generator there is a portion of the coal comparatively inactive. This is in the central part of the fire, extending from top to bottom, and is the result of lumps packing loosely about the outer edge of the fire, where the coals fall against the straight walls, and of being more compact in the center of the fire, where each lump accommodates itself to surrounding lumps. The observed result of this state of affairs is that the blast passes mostly up through the outer edge, or the course offering the least resistance, and the steam in its work finds a like course, and consequently combustion is not carried on uniformly throughout the generator. The portion of inactive fuel varies with the diameter and with

the size of coal. Thus in a particular generator egg coal renders about 30 per cent. of the construction of the fire partially inactive, the bulk of the work being done in the outer parts, representing 70 per cent. of the fuel; in the same way broken coal affects about 15 per cent. of the fuel bed, while steamboat and lump coal leave a practically free fire.

Generator Six Feet in Diameter.

Size of Coal.	Space Occupied by Coal.	Space Free for Blast and Steam.	Weight of Full Charge.	Approximate Surface of Coal in a Cubic Foot of Generator Space.
Lump....	50.76 per cent.	49.24 per cent.	3,825 lbs.	6 sq. feet.
Steamboat	52.90 "	47.10 "	3,986 "	7 "
Broken...	54.00 "	46.00 "	4,069 "	10 "
Egg.....	55.60 "	44.40 "	4,190 "	22 "

Specific gravity, 1.60.
Weight of cubic foot of solid coal, 100 lbs.

The table gives the distribution of coal and air space in a selected generator, and the weight of the charge and the approximate coal surface per cubic foot of space in the generator. This latter is of particular interest, as on the proper relation of coal surface to each cubic foot of space depends the ability to blast with sufficient free channels to allow the products to escape with but one part of carbon to two of oxygen, which can be done by keeping the greater part of the fire supplied with air in excess, a result attainable by hard blows. This same blast will also clear away accumulations of ash lodged throughout the fire. During the run the steam is best decomposed when in contact with the surface of coal lumps so packed as to make a circuitous course through the fire, compelling each part of oxygen to take its full complement of carbon and to go off as carbonic oxide. Although this is a consummation directly opposite of that sought for during the blow, it is made possible from the fact that the passage of gas during the run is about one third the velocity of the blast.

Experience has shown that lump coal is not an efficient size. It presents but 6 square feet for each cubic foot of generator space, and on account of its great size is difficult to handle. It is therefore doubtful if it would prove of advantage even in the largest generator made.

Steamboat presents 16.6 per cent. more surface than the lump, and for generators exceeding 8 feet in diameter it may have distinctive advantages. Among them less slack and waste from handling. A prohibitive condition, however, for both lump and steamboat, is that they can scarcely be handled by automatic conveyers.

Broken coal, if of a standard size, commends itself as offering all of the conditions that go toward the attainment of economical results. In generators exceeding a diameter of 5 feet of fire section a judicious mixture with steamboat might effect additional saving, throwing the broken coal well out about the edge of the fire, and dropping the steamboat in the center to make this part of the fuel bed less compact.

Egg coal is obviously wasteful. It lies so thoroughly packed that the highest blast would not prevent a wasteful production of carbonic oxide.

For all sizes the slack and waste should be screened and used elsewhere than in the generator.

3. Specific gravity is an approximate index to a coal's value, as it has been found that the density of a coal increases in a fairly constant ratio with the amount of inert or impure matters.

Coals with a specific gravity as high as 1.7 to 1.8 are not desirable—the best anthracites vary either way from about 1.5.

(4) Some final judgment may be formed from an examination of the ash and clinker, and the condition of the unconsumed coal. Here will be found undoubted evidence of the presence of slate, if such is suspected in the coal.

Much may be learned from the appearance of the clinker as to the condition of heats. With heats just approaching white in the hottest zones of the fire, a hard, semi-vitreous slag or stony clinker results, while with higher heats, the clinker or slag comes out a spongy, open mass, carrying with it unconsumed coal.

The latter must be wasted, as it being glazed with a coating of silica is irrecoverable.

Clinker formation cannot be prevented, but its nature can be controlled by watching the heats carried in the generator so as to form a hard, rigid clinker that may be readily cut away.

Color is the distinguishing characteristic of ash, it varying from a definite red through various shades of pink to a white or gray, according as the coal contains iron in greater or less amounts, or is entirely absent. A red ash coal promotes most actively the formation of clinker, and for that reason a hard, dense, white ash coal produces the least waste.

I have mapped out an investigation of the practical workings of anthracites in generator use, but the prolonged work of analysis and trial commenced last July is still incomplete, and the present paper is offered with the writer's regrets that his obligation remains unfulfilled.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

AT the annual meeting of the East Boston (Mass.) Gas Company the following officers were chosen: John Thompson, Thomas J. Whidden, Andrew G. Whidden, George L. Thorndike and William B. Pigeon; President, John Thompson; Treasurer and Clerk, J. Walter Andrews.

THE Berlin Iron Bridge Company, of East Berlin, Conn., has received the contract for an iron roof for the boiler and engine room of De Land & Co., at Fairport, N.Y. The roof will be covered with the Berlin Iron Bridge Company's patent anti condensation corrugated iron.

THE Bristol's Manufacturing Company, of Waterbury, Conn., has been incorporated under the name of the Bristol Company. President Bristol, in announcing the change, informs us that the Company is selling a large number of its gauges of the low ranges of pressure to gas companies throughout the country, and in every instance the gauges have given the highest satisfaction.

MR. W. W. PRICHARD, Superintendent of the Portsmouth (Ohio) Gas and Electric Company, writing to the JOURNAL under date of January 24th, says: "Business is pretty fair with us considering that our large shoe shops which are running on short time has cut into us some; still our business for the past three months shows a gain over two years ago. Within the last year we have put in a new arch of 6's complete, a new boiler, 1,600 feet of 4 inch mains, to equalize distribution, and laid 165 feet of pavement in front of works. We will have all our old lamp posts cut off at the main in a few days. I am taking this opportunity to make a map of our main system, as the only map we have was drawn from memory by the former President and Superintendent. So far as the business part of the city is concerned it is nearly correct, but on the back streets it is considerably off. Last week I found one of the old wooden mains in use, and it seemed to be in good condition. There is not a record of a single service here that I can find. I found the pipes in some houses badly stopped up with a dust which looks like iron rust, but seems to be impregnated with sulphur, as it burns when ignited. In the house that I moved to I could use only one burner at a time, so I attached the force pump to the service, and at the first blast blew out about a half pint of this dust. That was 17 months ago, and I have had no trouble since. Another thing, someone at some time here must have kept awake nights studying out how many elbows could be put on a service. I cleaned out one service last month and found, between the main and the house riser, 13 elbows. I took 8 of them out. These things are the result of a Superintendent having to keep the books of a Company, and sending 'Tom, Dick and Harry' out to put in services, the Superintendent having no time to look after them. I make it a point to go with the men, or failing that, they may expect me to come upon them at any moment. I find about 6 out of 10 of the meter connections trapped. In fact, my experience in the past 18 months would fill a good sized book. We are about to have incandescent light in opposition, to be furnished by the electric street railway. I have had some experience in that line, but am not alarmed; good service and fair treatment of consumers will make that all right. Our arc light plant has come up from 51 to 109 lights. The city has just renewed our franchise for 10 years."

THE P. H. & F. M. Roots Company, of Connersville, Ind., still has on hand a number of the paper weights distributed by it some time ago to the gas men, and President Roots informs us that the Company will, on receipt of a postal card from anyone desiring a weight, be pleased to forward the same.

THE Gas Light Company, of Columbus, Ga., has declared and paid its semi-annual dividend of 3 per cent.

THE Pawtucket (R. I.) Gas Company is paying much attention to the development of the supplying of electric power from its electric annex. The Company is now setting three more 150 horse power boilers, of the type furnished by the Bigelow Company, of New Haven. The Company is supplying electric power for the running of 28 railway cars in

Providence, and from Providence to Pawtucket, with 8 cars in Pawtucket and vicinity. It is also supplying current for general power purposes in Pawtucket, equivalent to 100 horse power per day, the motors running from 1 horse to 30 horse.

THE contract for the new tank and holder, to be erected by the Altoona (Pa.) Gas Company, has been awarded to Messrs. R. D. Wood & Co., of Philadelphia. It is to have a capacity of 1,000,000 cubic feet, and is to be of the 3-lift type.

AT the annual meeting of the Winsted (Conn.) Gas Company the following result was reached: Directors, H. G. Colt, H. L. Roberts, R. E. Holmes, E. Clarke, S. F. Dickerman, E. B. Parsons, W. L. Camp, Henry Gay and Henry Skinner; President, R. E. Holmes; Secretary and Treasurer, Henry Skinner.

THE proposition of the Cincinnati Gas Light and Coke Company to absorb the capital stock of the Cincinnati Electric Light Company, mention of which has been made in the JOURNAL, was adopted at a special meeting of the shareholders in the Gas Company, without any appreciable dissent. The Hon. E. A. Ferguson presided at the meeting, a feature of which was the presentation of a lengthy report from Mr. Norman G. Keenan, who in giving a detailed statement of the affairs of the Gas and Electric Light Companies, explained the advantage which would accrue to both Companies from a union of their interests. As has been said in the JOURNAL, the proposition was to increase the capital stock of the Gas Company from $7,500,000 to $8,100,000, the difference of $600,000 to be issued and exchanged par value for the $600,000 of electric light stock. In other words, the holder of 20 shares of electric light stock will receive one share of gas stock, both being considered at their par value. It has been stated all along that the only objection to the amalgamation was from holders of gas stock. Those who held some of both descriptions of shares were pleased with the opportunity to transfer, as were also the holders of electric shares only. Of a possible 75,000 shares to be voted, 64,853 were actually cast, an evidence of the interest manifested in the question. Of these, 63,149 shares were cast in favor of the proposition and 1,704 in opposition.

AT the annual meeting of the shareholders of the Capital Gas Company, of Sacramento, Cal., the following Directors were elected for the ensuing year: Messrs. B. U. Steinmann, C. H. Cummings, Frank Miller and Benj. Welch, of Sacramento, and Oliver Eldridge, H. F. Wood and John Demster McKee, of San Francisco. The Directors subsequently perfected the following organization: President, B. U. Steinmann; Vice-President, Oliver Eldridge; Secretary and Treasurer, C. H. Cummings; Manager, J. C. Pierson.

THE Fire Committee of the San Francisco Board of Supervisors recently considered the application of the Badlam Brothers for permission to exhibit their gasoline gas making apparatus at the Midwinter Fair, now going on in that city. After due deliberation the Committee unanimously decided that "the buildings in Sunset City should not be endangered by the exhibition therein of the apparatus manufactured by the applicants."

THERE is still some life left in the movement to start a Gas Company at Santa Monica, Cal.

WE understand that the Warren (R. I.) Gas Light Company has purchased the property and franchises of the Warren Electric Light Company.

THE franchise of the Springfield (Ills.) Gas Light Company will come to an end by limitation in a few weeks. Meanwhile the City Council, which body was appealed to by the Company for an extension of its franchise, has appointed a special committee to investigate the conditions governing the gas supply in other cities, the report of same to be the basis of the renewed franchise. It is understood that the report will be submitted to the meeting of the Council to be held to-day.

THE Philadelphia *Record* of January 28 says: "The Trustees of the Northern Liberties Gas Company have decided to reduce the price of gas from $1.50 to $1.25 per 1,000 cubic feet, despite the efforts of the city's representatives on the Board to secure a reduction to the dollar rate recently adopted by Councils for the gas supplied in the balance of the city of Philadelphia. The Northern Liberties Company supplies that territory bounded by Vine and Thompson streets, between the east side of Sixth street and the Delaware river, and, being an independent corporation, is not amenable to the ordinance of Councils. The new rate will be put in force on February 1, and will affect between 15,000 and 20,000 consumers. President Isaac Shepard, of the Board of Trustees, said that the financial condition of the Company precluded the possibility of a reduction below the $1.25 rate, if a profit is to be made, and consequently the Trustees had declined to meet the city rate. The Company, he said, pays a corporation tax to the State, and the regular legal tax on dividends, and in all respects considers itself a regular and legitimate corporation under the laws of the State and city."

THE San Francisco Gas Light Company supplies gas to 24,875 consumers.

THE Free Library of San Francisco is hereafter to be lighted by means of the Welsbach incandescent burners.

THE sub committee of the House Committee, of Congress, on the District of Columbia, which was charged with the task of "investigating the relations of the Washington Gas Light Company to the District and to the Government," has commenced the investigation. The first formal session of the sub-committee, at which evidence was submitted, was held on January 23d, and the following is a summary of the testimony given: Mr. John R. McLean, President of the Company, made a brief statement to the effect that he had been connected but a short time with the Company in an official capacity, and had no practical knowledge of the business, but he had given instructions that the gas manufactured by the Company should be equal to the best in the United States, and supposed that the people were getting it, as no expense was spared to effect that end. Doctor J. Townsend Ford, the Government Gas Inspector, explained at great length the nature of his duties and the result of his work. He said that he made three inspections a day, at periods ranging from noon until midnight, and the inspections related to the purity, pressure and candle power of the gas manufactured in the District. He said he made his observations and tests in a specially equipped laboratory, containing the best tools and the finest quality of instruments used for testing purposes. He testified that the candle power of gas furnished by the Company was above the average required by law, which was 16. It averaged nearly if not quite 17, and he thought that the gas furnished in the District of Columbia was as good as it was anywhere. He found that the complaints of the consumers usually grew out of local causes, such as inferior plumbing, inadequate supply pipes and defective pipes generally. Supt. Leetch said he had been instructed by the President of the Company to give the committee every assistance possible to arrive at an intelligent understanding of the situation, and to place at its disposal any records or information in the possession of the Company which would facilitate its labors. They had nothing to conceal. He explained that the gas manufactured and distributed in Washington was a mixture of coal and water gas. He had been instructed to make the best gas that it is possible to produce, and had tried to comply with this order. He thought complaints were due not to the quality of the gas, but to local causes. By way of illustration he spoke of a certain hotel much frequented by members of Congress, one of the latter being a member of the District Committee. Complaints had been made by the guests as to the quality of the gas, and the Company instructed one of its employees to make an investigation. He found that the hotel had three meters, two small ones and one large one. Both the small meters had been completely shut off by the hotel people, and all the gas that the burners in the house were using passed through the large meter, which had been turned half off, so that the light was unsatisfactory, not from any shortcoming on the part of the Company, but from the desire of the landlord to reduce expenses. Supt. Leetch said there were times when, owing to atmospheric conditions, the gas was affected, and at such times the complaints were more numerous than under more favorable conditions. On such occasions it had happened that 300 complaints a day had been received; but as a rule the complaints were limited to from 30 to 40 per day. The Company kept a force of men on duty, often till 9 o'clock in the evening, to respond to complaints of bad gas. In the majority of cases the fault lay with the supply pipes. Many of the street mains were put in 30 or 35 years ago, and under the corrosive influence of the gas on the iron, flakes would fall into the pipes and prevent the free passage of the gas. The Company, he said, could not furnish good gas if the plumbing were defective. Touching the complaints as to the supply of gas to the public buildings, Mr. Leetch said he had discovered that in most of the public buildings so-called "governors" were used. These governors, the adoption of which was dictated by motives of economy, interfered with the pressure, with the result that it

was impossible to get good light. The Superintendent also said that the cost of distributing gas in the District of Columbia is very much greater than in any other city of the country, owing to the prevalence of concrete paving. The Company was compelled to lay its pipes in the open streets instead of under the curbing, and had to dig through the concrete. In no other city were the streets so generally paved with concrete as Washington. In addition to this the Company was compelled to pay the Commissioners for repaving the streets, instead of doing the work by contract. The charges were those usually made for that kind of work. He said many of the mains were old, and orders had been given for 18 miles of main pipes to replace old ones, and for new extensions. The Company had asked permission to relay the mains on one street from Ninth to Fifteenth, and the Commissioner had required a deposit of $3,500 for the repairs of the streets. Mr. John McIlhenny also testified, his remarks being in line with those of Inspector Ford and Supt. Leach. The committee adjourned, to meet the following day, but we have had no further account of the proceedings. In connection with the first session it is worthy of note that, although the hearing had been well advertised, the only persons present were those comprising the committee and the representatives of the Company, which would not seem to indicate any remarkable amount of opposition by the general public to the way in which the gas supply of the city is being carried on.

In our advertising columns will be found an announcement from Mr. H. B. Beatty, Treasurer of the Bristol (Pa.) Gas Light Company, that the Company will receive bids for its coal tar output for the year beginning March 1, 1894, and ending March 1, 1895, the bids to be opened March 1st, next, at 4 P. M. The output is estimated at 250 bbls.

At the annual meeting of the Springfield (Mass.) Gas Light Company the following action was taken: Directors, William H. Haile, Marvin Chapin, Elisha Gunn, James A. Rumrill, H. S. Lee, Samuel W. Porter, E. S. Brewer, D. Chauncey Brewer and Homer L. Bosworth; Treasurer, I. B. Allen; Clerk, Edward S. Brewer. The only change in the Directorate was the election of Mr. Homer L. Bosworth, who replaces Mr. James Kirkham, deceased. At the meeting the following resolutions respecting Mr. Kirkham were passed:

Whereas, James Kirkham, a leading citizen of Springfield, and for four years a member of the executive board of this corporation, has been removed by death.

Resolved, That the Directors and stockholders of the Springfield Gas Light Company bear testimony to the fidelity with which Mr. Kirkham served their common interests while in office and to the judgment and intelligence which he brought to their councils.

Resolved, That these resolutions be placed upon the records.

We understand that the Selectmen of Cottage City, Mass., have granted the petition of H. S. Kemp and others who desire to operate an electric lighting plant at that place.

Some days ago a meter inspector of the Worcester (Mass.) Gas Light Company discovered that a meter, which was nominally measuring the gas used in a prominent boarding house of that city, had been bye-passed. The proprietor of the place willingly settled the bill that was made out for him.

The proprietors of the Greenfield (Mass.) Gas Light Company have declared the usual semi-annual dividends of 2 per cent. on the common and 3 per cent. on the preferred stock.

The people of Annapolis, Md., complain that they are obliged to pay too much for the gas and electric illumination furnished them by the Annapolis Gas Light Company. In fact, so great has been the grumbling that the authorities are seriously considering the advisability of installing a plant to be operated on municipal account.

The Directors chosen to manage the affairs of the Shenandoah (Pa.) Gas Light Company, the Shenandoah Electric Illuminating Company and the Shenandoah Heat and Power Company are Messrs. J. S. Callen, J. S. Kistler, J. M. Robbins, P. J. Gaughan, H. W. Tilman, S. A. Beddall, H. W. Swalm, Geo. W. Beddall and L. J. Wilkinson.

Mr. D. E. Fleming, of Fredericksburg, Va., is looking over the town of Newport News, Va., with a view to determining whether the place would be up to sustaining a gas works. He has met with considerable encouragement from the business men of the "News," and it is not improbable that his project will be carried to completion.

A slight fire occurred the last week in January at the works of the Owego (N.Y.) Gas Company. The ignition of tar was at the bottom of the blaze.

The business offices of the New Bedford (Mass.) Gas Light Company are to be removed from the Winslow block, on Union street, to the building formerly occupied by the Edison Company, on Middle street.

At the annual meeting of the Bristol (R.I.) Gas Light Company the following officers were chosen: Directors, Robt. S. Franklin, James C. Swan, H. W. Church, J. H. Manchester, N. Cole; President, N. Cole; Secretary, R. S. Franklin; Treasurer and Superintendent, J. H. Manchester.

On January 27 Judge Simonton, of Harrisburg, Pa., handed down an important opinion in a case in which the Westinghouse Natural Gas Company was the defendant. The opinion shows that the Company had a paid-up capital stock of $7,500,000, which it returned for taxation to the Auditor General in 1892 at a value of $18 per share, being a little higher than the market price at that time. The report showed the net earnings of the Company to have been $842,215.12. The State officers, upon a construction of the law adopted by them, held that the capital must be taxed at such sum as would at 6 per cent. produce the net earnings reported, and on this basis they raised the capital stock value to $17,600,000, and imposed a 5 mill tax upon the same, amounting to $88,000. M. E. Olmsted, of Harrisburg, attorney for the Company, appealed from this taxation to the Dauphin County Court. In opinion just filed the Court considers the evidence which showed the uncertain character of the business of natural gas companies, and practically holds that net earnings of such companies, a large part of which must be expended in procuring new gas wells to keep up the supply, are not to be applied on the construction of law asked for by the Commonwealth. The report showed that the stock sold in 1892 as low as $12 per share, and upon all the evidence the Court finds that the appraisement of the Company's officers was fair and just. The opinion also sustained the position of the Company's counsel that capital stock invested by the Company in patents is not taxable. The total tax found due the Commonwealth is $11,700, but payments having been made on account, the judgment is for $4,746.

Gustav H. Schmidt, who resides with his family at 1619 North Broadway, Baltimore, Md., was recently tried in the Criminal Court of that city on the charge of having defrauded the Consolidated Gas Company. Last summer he was away from the city for some weeks, and instructed the Company to remove the gas meter from his house. Thomas G. Nicholson, an inspector for the Gas Company, had his attention called to the fact that after the meter had been removed gas was being burned in the house, and he made a personal examination. He found that all of the lights were turned on, and going into the cellar, accompanied by the policeman on the block, he discovered that a connection had been made with the pipes by means of a rubber tube. Lawyer Heninghausen, for Schmidt, claimed that he had no knowledge that the gas was being burned, and said that his daughters might have done it for the purpose of entertaining their company. The jury found him not guilty.

At the annual meeting of the Hoosick Falls (N. Y.) Gas Light Company, the following Directors were elected: C. E. Dudley Tibbits, J. Hobart Warren, Danforth Gier, C. A. Cheney and T. J. Wallace.

Cape May, N. J., gas consumers are growling over the gas that is supplied them by the Cape Island Gas Company. They also object to the price, which is the pretty stiff one of $2.75 per 1,000 cubic feet.

At the annual meeting of the Helena (Mont.) Gas Light and Coke Company and the Helena Electric Company, the following Trustees were elected: H. M. Parchen, C. W. Cannon, T. A. Marlow, H. Gans, T. H. Kleinschmidt, A. M. Holter and H. L. Walker. The Trustees subsequently perfected the following organization: President, H. M. Parchen; Vice-President, T. A. Marlow; Secretary and Treasurer, H. L. Walker.

The contract for the supply of gas coal to the Peoria (Ills.) Gas Light and Coke Company for the ensuing year was awarded to the North Bend Coal Company, at its bid of $3.14 per ton for lump coal, and $3.04 per ton for "run of the barge."

The Market for Gas Securities.

Consolidated is weak and dull, the opening price to-day (Friday) being 122½ bid, offered at 123¼. It is a very difficult matter to offer advice in respect to this security just now, for so much depends on the action of the Legislature in respect to ordering a change in the gas rate. A bill lowering the gas rate to $1 per 1,000 cubic feet in the cities of New York and Brooklyn is before the lawmakers, but it does not seem to have been offered in good faith. Certainly there is no public clamor for cheaper gas; in fact, there has not been the semblance of public demand for a revision of gas rates since the passage of the $1.25 bill, which goes to show that the bills of last year and this are of the suspicious order. The market for Consolidated gas is virtually nil, as witness the outcome of yesterday's trading in it on the Stock Exchange, when different lots of the stock, in all amounting to 59 shares, were sold at prices varying between 124¼ and 122⅝. Other city shares are fairly steady, notably Mutual and Standard preferred.

Brooklyn shares show no change, and it is asserted with great positiveness that the Citizens Company is now in full accord with the Addicks interest. Rumors of *quo warranto* proceedings against the Chicago Company were renewed, but the net result for the week is only a decline of 1½ points, and the stock is certainly a purchase at the reported figures. Baltimore Consolidated is buoyant, at 56¼ to 57, and Bay State is a trifle weaker, at 15 bid. At auction this week: 100 Consolidated, city, at 123¼; 27 Standard, preferred, at 75; and 50 Mutual, at 148½.

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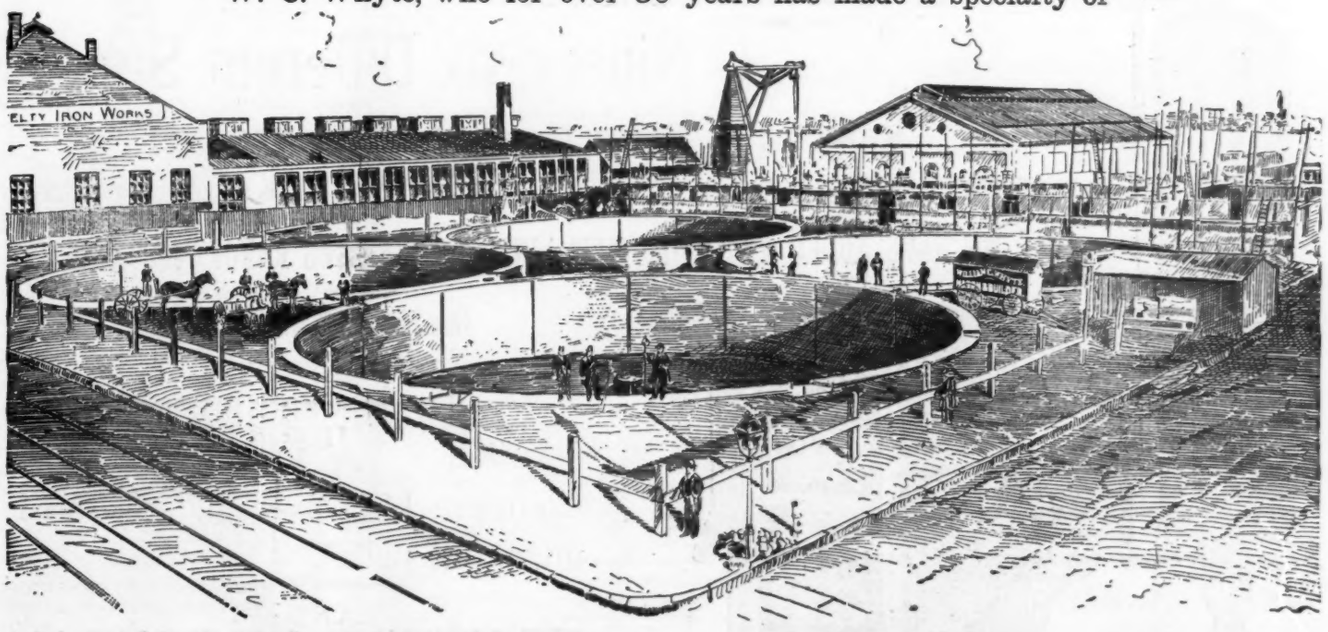

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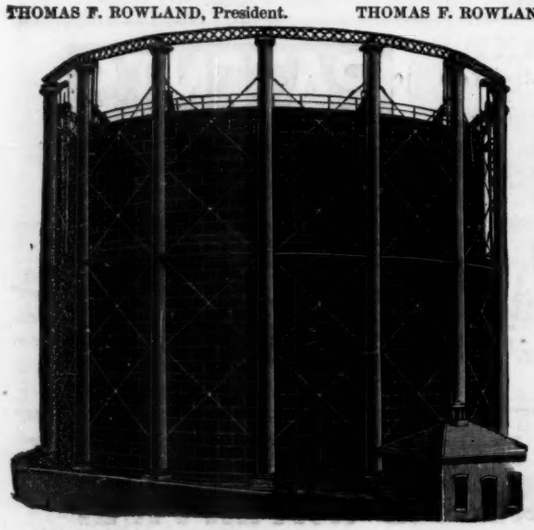

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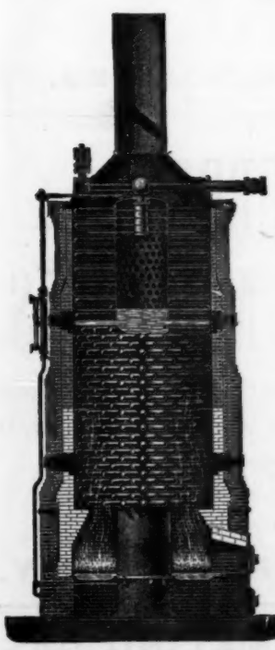

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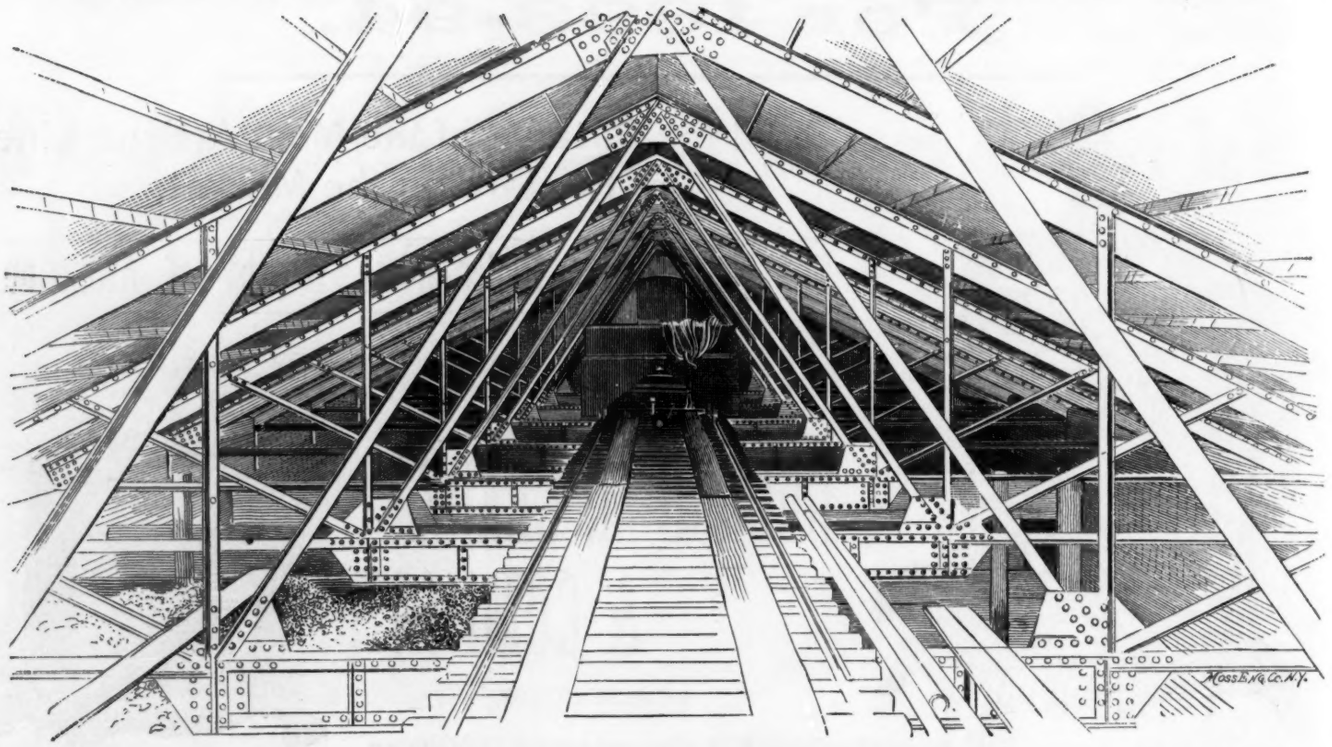

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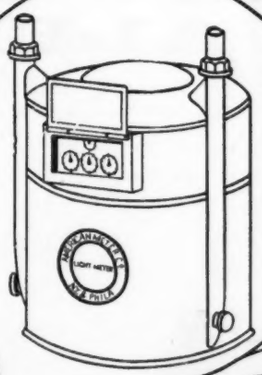

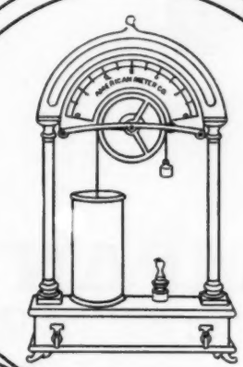

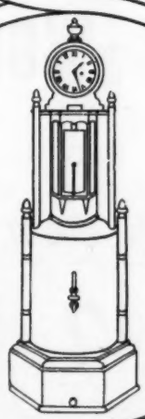

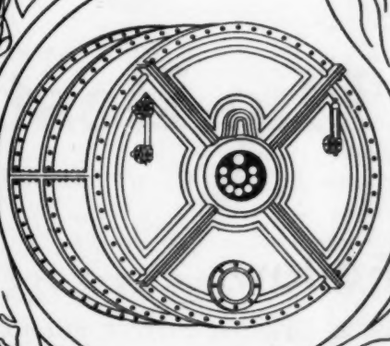

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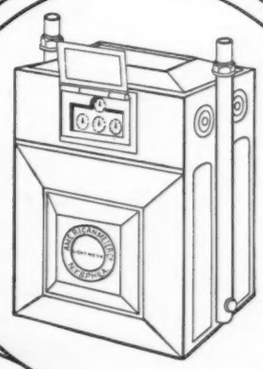
PUBLIC LIGHTING TABLE.

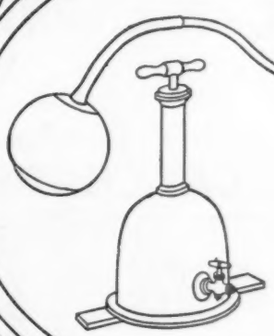
FEBRUARY, 1894.

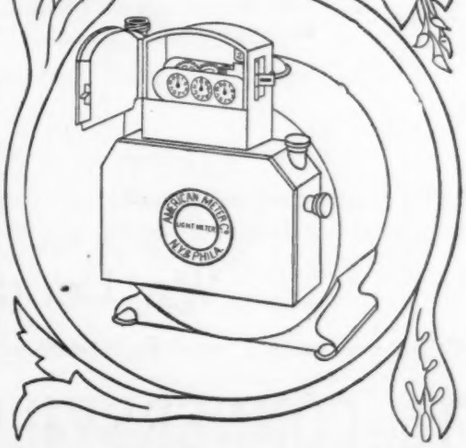
Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Table No. 1. Following the Moon. Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Table No. 2. New York City. All Night Lighting. Extinguish.
				P.M.	A.M.
Thu.	1	5.50 PM	6.10 AM	5.05	6.15
Fri.	2	5.50	6.10	5.05	6.15
Sat.	3	5.50	6.10	5.05	6.15
Sun.	4	5.50	6.10	5.05	6.15
Mon.	5	5.50 NM	6.10	5.10	6.10
Tue.	6	5.50	6.00	5.10	6.10
Wed.	7	6.00	6.00	5.10	6.10
Thu.	8	6.00	6.00	5.10	6.10
Fri.	9	6.00	6.00	5.10	6.10
Sat.	10	9.40	6.00	5.10	6.10
Sun.	11	10.40	6.00	5.10	6.10
Mon.	12	12.00	6.00	5.20	5.55
Tue.	13	1.10 AM FQ	6.00	5.20	5.55
Wed.	14	2.20	5.50	5.20	5.55
Thu.	15	3.30	5.50	5.20	5.55
Fri.	16	4.30	5.50	5.20	5.55
Sat.	17	No L.	No L.	5.20	5.55
Sun.	18	No L.	No L.	5.20	5.55
Mon.	19	No L. FM	No L.	5.30	5.55
Tue.	20	6.10 PM	7.30 PM	5.30	5.55
Wed.	21	6.10	8.40	5.30	5.55
Thu.	22	6.10	9.50	5.30	5.55
Fri.	23	6.10	11.00	5.30	5.55
Sat.	24	6.20	12.10 AM	5.30	5.55
Sun.	25	6.20	1.10	5.30	5.55
Mon.	26	6.20	2.20	5.30	5.45
Tue.	27	6.20 LQ	3.20	5.30	5.45
Wed.	28	6.20	4.10	5.30	5.45

TOTAL HOURS LIGHTING DURING 1894.

By Table No. 1.	Hrs. Min.	By Table No. 2.	Hrs. Min.
January	244.10	January	423.20
February	195.30	February	355.25
March	206.20	March	355.35
April	169.40	April	298.50
May	162.10	May	264.50
June	135.40	June	234.25
July	146.30	July	243.45
August	162.20	August	280.25
September	174.10	September	321.15
October	211.20	October	374.30
November	221.00	November	401.40
December	245.30	December	433.45
Total	2274.20	Total	3987.45







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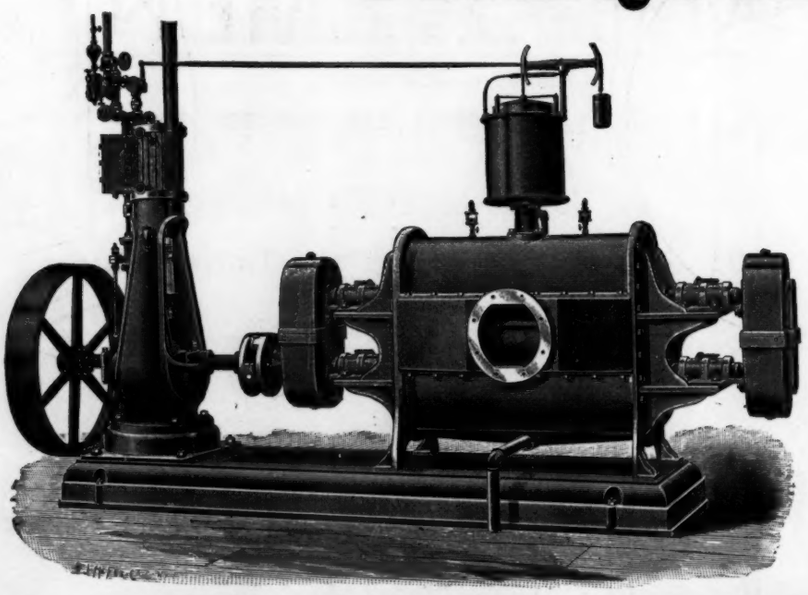

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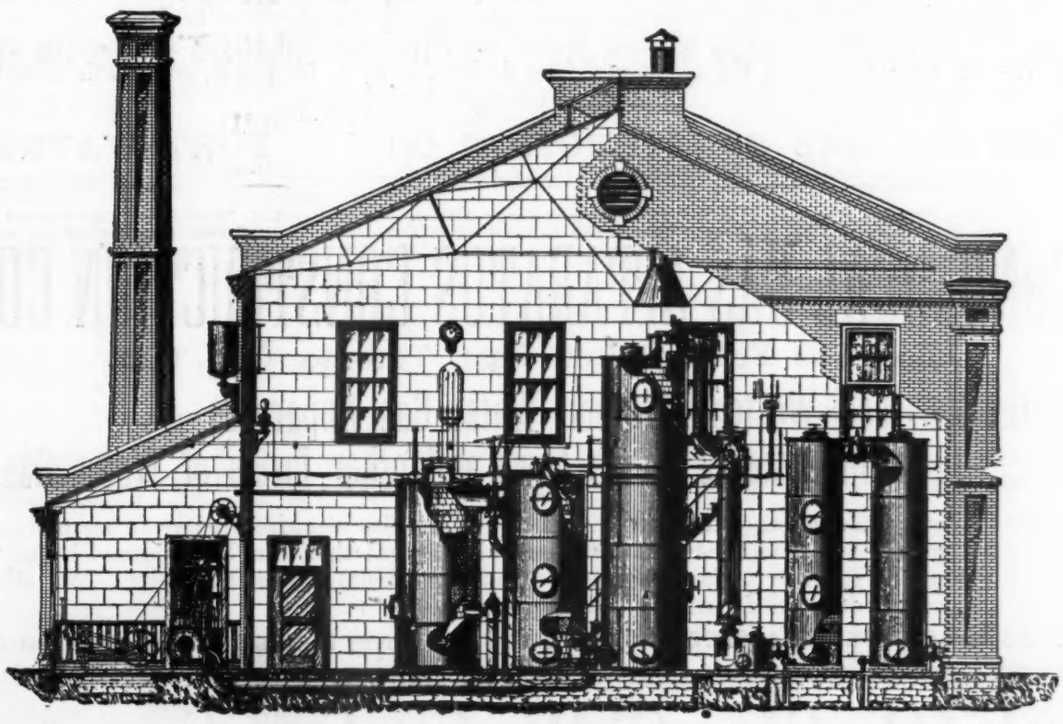

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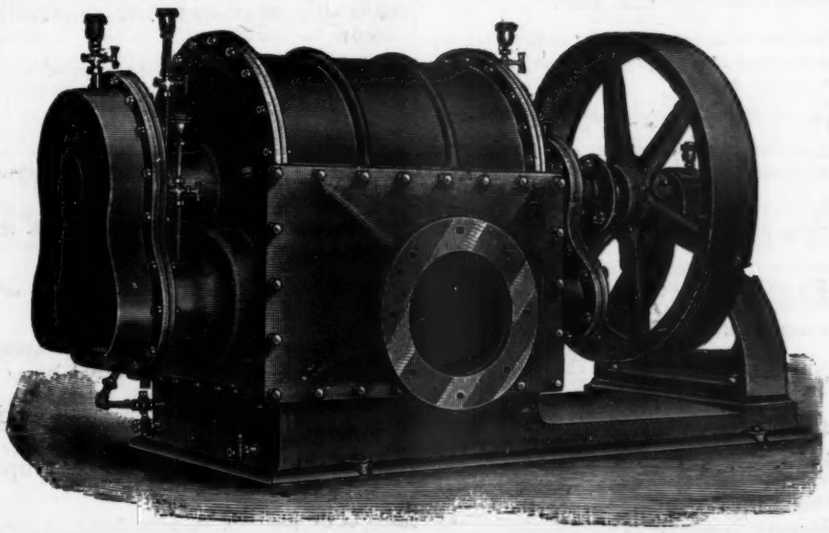

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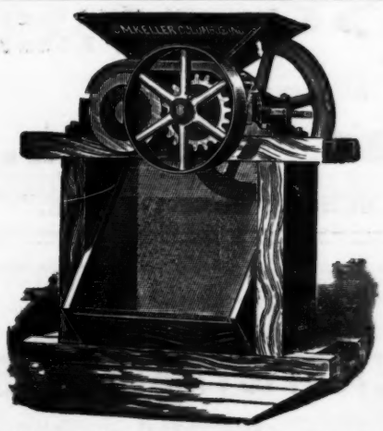

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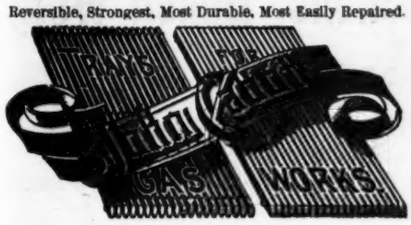

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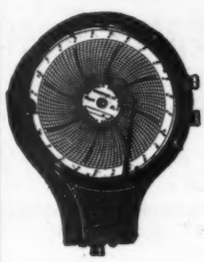

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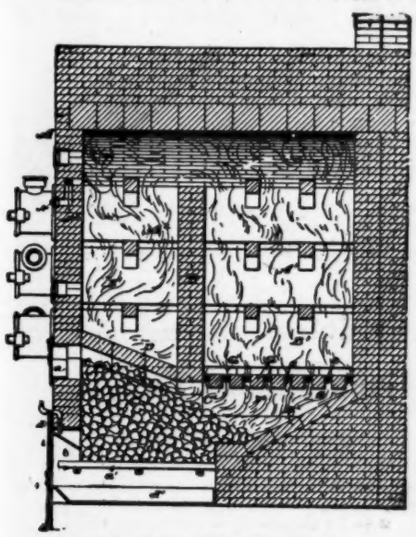

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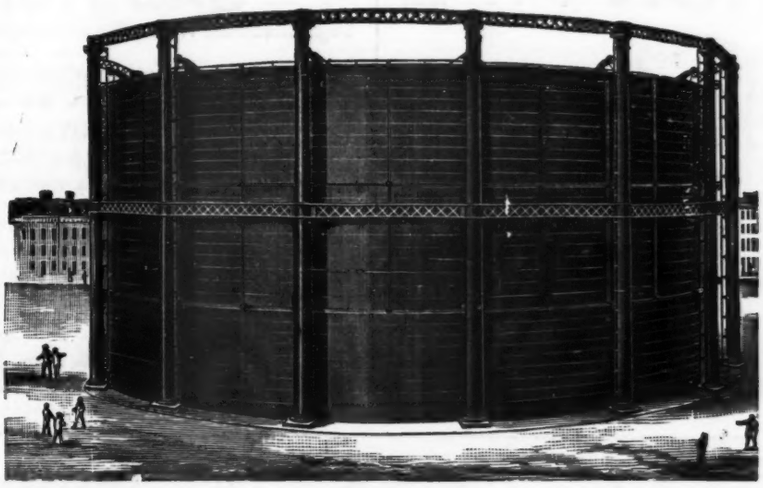

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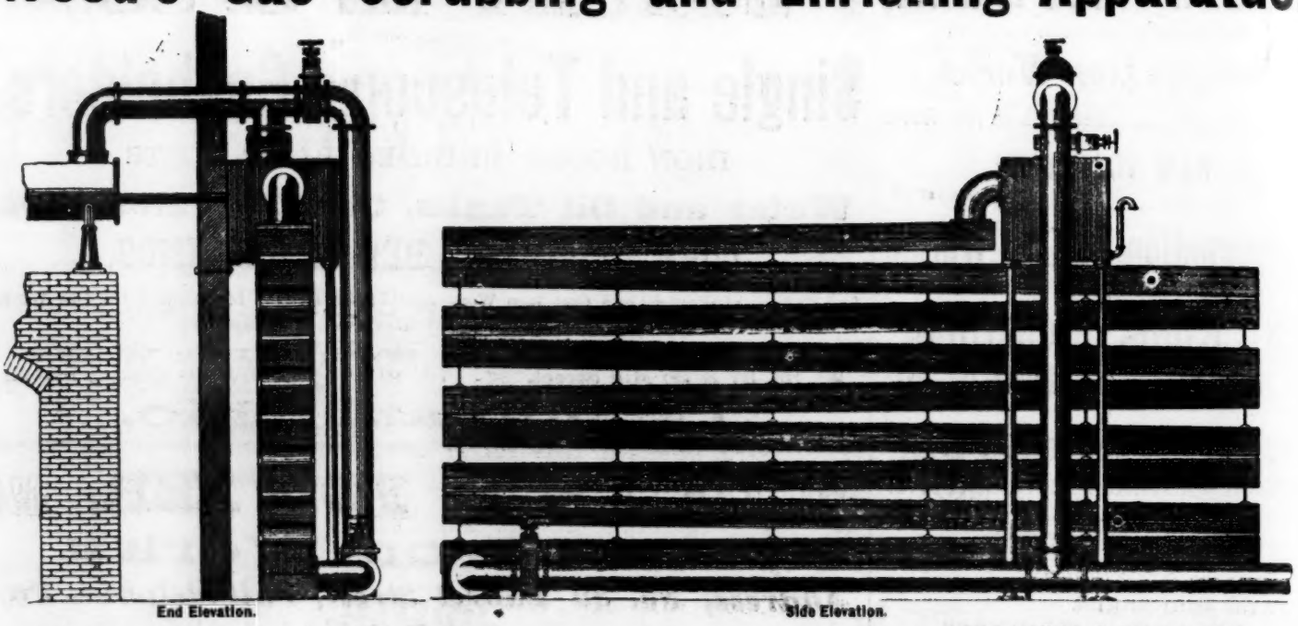

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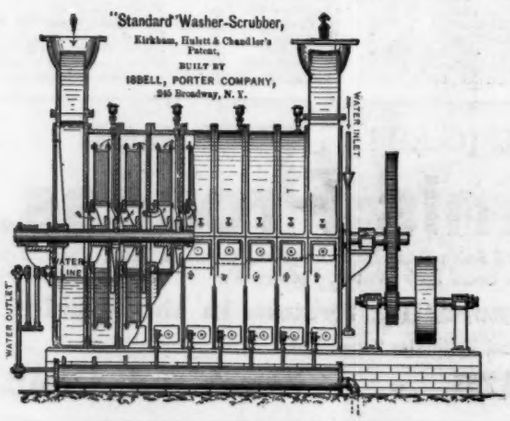

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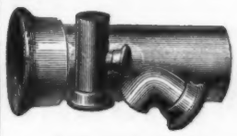

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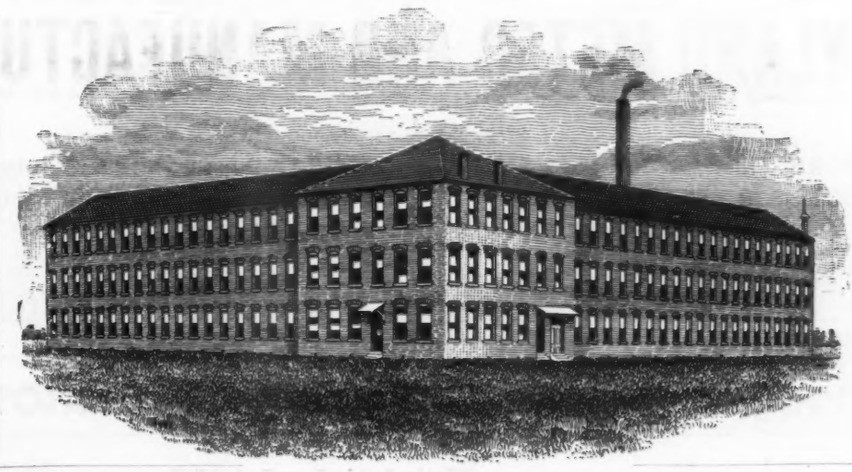

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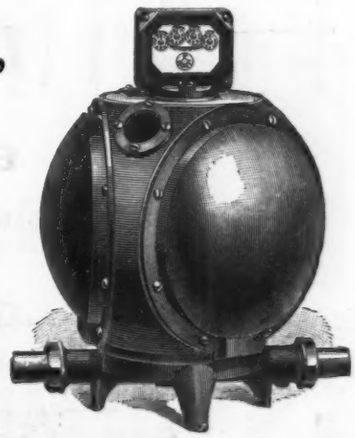

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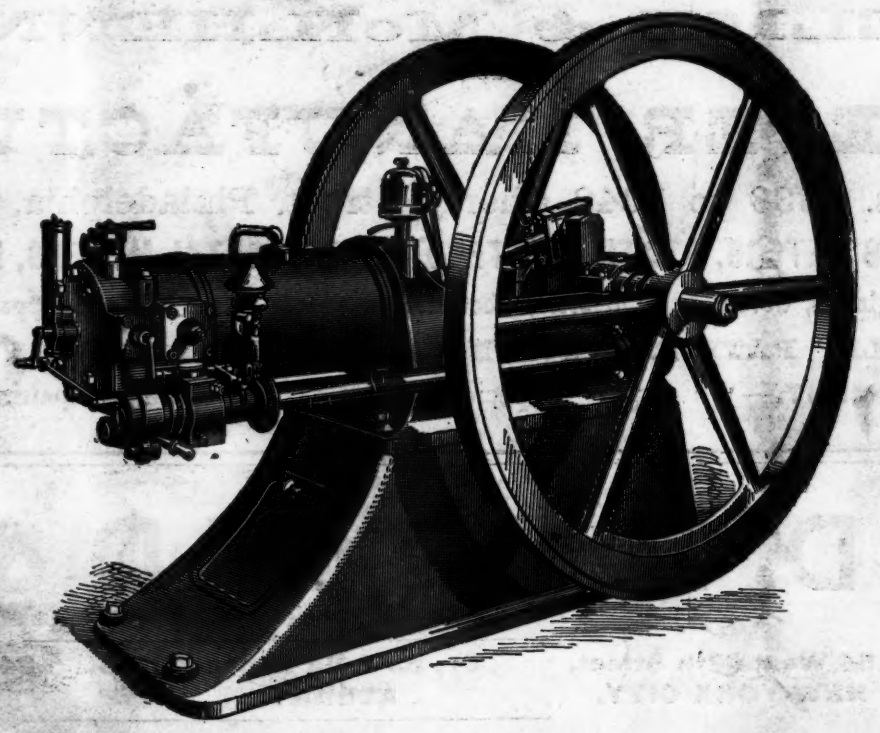

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